6.0 ECONOMIC IMPACT ANALYSIS

6.1 Major Industries Impacted

In this section the industries which will have some of the greatest impacts are profiled, using 1997 Census of Manufacturers data. The industries profiled, listed below, represent much of the total waste which is affected under the anticipated rule.

- Basic Chemicals (NAICS 3251)
  - Petrochemical (NAICS 325110)
  - Other Basic Organic Chemicals (NAICS 325199)
  - Other Inorganic Chemicals (NAICS 325188)
  - Inorganic Dyes and Pigments (NAICS 325131)
  - Cyclic Crudes and Intermediates (NAICS 325192)

- Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments (3252)
  - Plastic Materials and Resins (NAICS 325211)

- Pharmaceutical and Medicine Manufacturing (NAICS 3254)
  - Pharmaceutical Preparations (NAICS 325412)

- Nonferrous Metal (except aluminum) Production and Processing (NAICS 3314)
  - Primary Smelting and Refining of Copper (NAICS 331411)
  - Other Nonferrous Metal Primary Smelting and Refining (NAICS 331419)
  - Secondary Smelting, Refining and Alloying of Copper (NAICS 331423)
  - Other Nonferrous Metal Secondary Smelting, Refining, Alloying Manufacturing (NAICS 331492)

- Coating, Engraving, Heat Treating, and Allied Activities (NAICS 3328)
  - Plating and Polishing (NAICS 332813)

- Semiconductor and Other Electronic Component Manufacturing (NAICS 3344)
  - Printed Circuit Board (NAICS 334412)

6.1.1 Basic Chemical Industry

The Basic Chemical Industry includes a broad range of industries. For the purpose of our analysis, we will be focusing on the four major industries: Petrochemical (NAICS 325110), Other Basic Inorganic Chemical (NAICS 32518), Other Basic Organic Chemical (NAICS 32519) and Inorganic Dye and Pigment (NAICS 325131).

6.1.1.1 Petrochemical Industry Profile

The petrochemical manufacturers are listed under the NAICS code 325110 (SIC 2865 and 2869). This industry is a part of the chemical manufacturing industry (NAICS 325) and comprises establishments primarily engaged in (1) manufacturing acrylic, and (2) manufacturing cyclic aromatic hydrocarbons.[1]

6.1.1.1.1 Production and Shipment Values

Table 6-1 provides a summary of the estimated U.S. total value of shipments of petrochemicals for 1997.

Table 6-1. Estimated United States Total Value of Shipments of Petrochemical Products: 1997

YEAR	TOTAL VALUE OF SHIPMENTS ($1,000)
1997	20,534,750

Source: 1997 Census of Manufacturers, USDC.

6.1.1.1.2 Industry Size and Market Share

Data used to characterize this industry are from the 1997 Census of Manufacturers and Census Current Industrial reports. The 1997 Census data indicate that there are 54 facilities located in within the U.S., owned by 42 companies. More than half of the industry, in terms of aggregate value of shipments, is dominated by approximately 11 percent of all facilities. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-2.

Table 6-2. Distribution of Facilities by Employment for the Petrochemical Industry

Employees Per Facility	Number of Facilities	Percent of Facilities	Percent of Total Shipments Value
1- 19	11	20.4%	0.1%
20 - 49	5	9.3%	0.5%
50 -99	10	18.5%	4.2%
100 - 249	13	24.1%	13.0%
250 - 499	9	16.7%	25.4%
500 & above	6	11.0%	56.8%
Total	**54**	100.0%	100.0%

[1] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC.*

Table 6-2. Distribution of Facilities by Employment for the Petrochemical Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
Source: 1997 Census of Manufacturers, USDC.			

6.1.1.1.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $576,357,000.

6.1.1.2 Other Organic Chemical Industry Profile

The other organic chemical manufacturers are listed under the NAICS code 325199. This industry is a part of the chemical manufacturing industry (NAICS 325) and comprises establishments primarily engaged in manufacturing basic organic chemicals (except petrochemicals, industrial gases, and synthetic dyes and pigments).[2]

6.1.1.2.1 Production and Shipment Values

Table 6-3 provides a summary of the estimated U.S. total value of shipments of other organic chemical products for 1997.

Table 6-3. Estimated United States Total Value of Shipments of Other Organic Chemical Products: 1997	
YEAR	**TOTAL VALUE OF SHIPMENTS ($1,000)**
1997	53,542,377
Source: 1997 Census of Manufacturers, USDC.	

[2] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC.*

6.1.1.2.2 Industry Size and Market Share

Data used to characterize this industry are from the 1997 Census of Manufacturers and Census Current Industrial reports. The 1997 Census data indicate that there are 676 facilities located in within the U.S., owned by 487 companies. Over 70 percent of all facilities employ fewer than 100 people. While more than half of the industry, in terms of aggregate value of shipments, is dominated by approximately 5 percent of all facilities. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-4.

Table 6-4. Distribution of Facilities by Employment for the Other Organic Chemicals Industry

Employees Per Facility	Number of Facilities	Percent of Facilities	Percent of Total Shipments Value
1- 19	251	37.1%	2.5%
20 - 49	136	20.1%	4.1%
50 -99	100	14.8%	8.2%
100 - 249	118	17.5%	20.4%
250 - 499	33	4.9%	14.2%
500 & above	38	5.6%	50.6%
Total	**676**	100.0%	100.0%

Source: 1997 Census of Manufacturers, USDC.

6.1.1.2.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $185,672,000.

6.1.1.3 Other Inorganic Chemical Industry Profile

The other inorganic chemical manufacturers are listed under the NAICS code 325188 (and SIC 2819). This industry is a part of the chemical manufacturing industry (NAICS 325) and comprises establishments primarily engaged in manufacturing basic inorganic chemicals (except industrial gases, inorganic dyes and pigments, alkalies and chlorine and carbon black).[3]

6.1.1.3.1 Production and Shipment Values

[3] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC.*

Table 6-5 provides a summary of the estimated U.S. total value of shipments of other inorganic chemical products for 1997.

Table 6-5. Estimated United States Total Value of Shipments of Other Inorganic Chemical Products: 1997

YEAR	TOTAL VALUE OF SHIPMENTS ($1,000)
1997	17,255,506

Source: 1997 Census of Manufacturers, USDC.

6.1.1.3.2 Industry Size and Market Share

Data used to characterize this industry are from the 1997 Census of Manufacturers and Census Current Industrial reports. The 1997 Census data indicate that there are 638 facilities located in within the U.S., owned by 387 companies. About 28.6 percent of all facilities employ fewer than 100 people. Almost half of the industry, in terms of aggregate value of shipments, is dominated by approximately 5 percent of all facilities. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-6.

Table 6-6. Distribution of Facilities by Employment for the Other Inorganic Chemicals Industry

Employees Per Facility	Number of Facilities	Percent of Facilities	Percent of Total Shipments Value
1- 19	330	51.7%	5.9%
20 - 49	139	21.8%	10.7%
50 -99	73	11.4%	12.0%
100 - 249	63	9.9%	25.5%
250 - 499	21	3.3%	12.5%
500 & above	12	1.9%	33.4%
Total	**638**	100.0%	100.0%

Source: 1997 Census of Manufacturers, USDC.

6.1.1.3.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $91,371,000.

6.1.1.4 Inorganic Dye and Pigment Industry Profile

Inorganic dye and pigment manufacturers are listed under the North American Industrial Classification (NAICS) code 325131 (and SIC 2816 and 2819). The inorganic dye and pigment manufacturers are a part of the chemical manufacturing industry (NAICS 325) and this industry comprises establishments primarily engaged in manufacturing industrial inorganic chemicals and inorganic pigments.[4]

6.1.1.4.1 Production and Shipment Values

Table 6-7 provides a summary of the estimated U.S. total value of shipments of inorganic dye and pigments from 1994 - 1998.

Table 6-7. Estimated United States Total Value of Shipments of Inorganic Dye and Pigments: 1994 - 1998

YEAR	TOTAL VALUE OF SHIPMENTS ($1,000)
1998	2,526,126
1997	2,606,048
1996	2,486,663
1995	2,284,232
1994	2,470,873

Source: U.S. Department of Commerce, Bureau of the Census, Current Industrial Reports, *Inorganic Chemicals 1998*, MA 325A(98)-1, February, 2000

6.1.1.4.2 Industry Size and Market Share

Data used to characterize the inorganic dye and pigment industry are from the 1997 Census of Manufacturers and Census Current Industrial reports. The 1997 Census data indicate that there are 74 facilities located in within the U.S., owned by 58 companies. About 65 percent of all facilities employ fewer than 100 people. Almost half of the industry, in terms of aggregate value of shipments, is dominated by approximately 6 percent of all facilities. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-8.

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[4] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC.*

Table 6-8. Distribution of Facilities by Employment for the Inorganic Dye and Pigment Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
1- 19	24	32.4%	1.4%
20 - 49	16	21.6%	4.3%
50 -99	8	10.8%	4.4%
100 - 249	14	18.9%	18.5%
250 - 499	8	10.8%	27.6%
500 & above	4	5.5%	43.9%
Total	**74**	100.0%	100.0%
Source: 1997 Census of Manufacturers, USDC.			

6.1.1.3.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $77,556,000.

6.1.1.5 Cyclic Crudes and Intermediates Industry Profile

Cyclic crudes and intermediates manufacturers are listed under the NAICS code 325192 (and under the SIC as industry 2865). The cyclic crudes and intermediates manufacturing industry is a part of the chemical manufacturing industry (NAICS 325). Establishments in this industry are primarily engaged in manufacturing cyclic organic crudes and intermediates, and organic dyes and pigments. Important products of this industry include: (1) aromatic chemicals, such as benzene, toluene, mixed xylenes naphthalene; (2) synthetic organic dyes; and (3) synthetic organic pigments.
87,345

6.1.1.5.1 Shipment Values

Table 6-9 shows the estimated total value of shipments of cyclic crudes and intermediate products for 1997.

Table 6-9. Estimated United States Total Value of Shipments of Cyclic Crudes and Intermediate Products: 1997	
YEAR	**VALUE OF SHIPMENTS ($1,000)**
1997	5,975,157

Table 6-9. Estimated United States Total Value of Shipments of Cyclic Crudes and Intermediate Products: 1997
Source: 1997 Census of Manufacturers, USDC.

6.1.1.5.2 Industry Size and Market Share

Data used to characterize the cyclic crudes and intermediates industry are from the 1997 Census of Manufacturers. The 1997 Census data indicate that there are 50 facilities located in the U.S., owned by 35 companies. Over 60 percent of facilities employ fewer than 100 people. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-10.

Table 6-10. Distribution of Facilities by Employment for the Cyclic Crudes and Intermediates Industry

Employees Per Facility	Number of Facilities	Percent of Facilities	Percent of Total Shipments Value
1- 19	12	24.0%	15.7%
20 - 49	9	18.0%	2.8%
50 -99	11	22.0%	5.3%
100 - 249	7	14.0%	15.8%
250 & above	11	22.0%	60.4%
Total	**50**	100.0%	100.0%

Source: 1997 Census of Manufacturers, USDC.

6.1.1.5.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $180,181,000.

6.1.2 Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments

The Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments industry (NAICS 3252) includes a broad range of industries. For the purpose of our analysis, only the Plastic Material and Resin Manufacturing Industry will be examined.

6.1.2.1 Plastic Material and Resin Manufacturing Industry Profile

Plastics material and resin manufacturers are listed under the NAICS code 325211 (and under the SIC as industry 2821). This industry is a sub-sector of the chemical manufacturing industry (NAICS 325). This industry comprises establishments primarily engaged in the manufacturing of synthetic resins, plastics materials, and non-vulcanizable elastomers. [5]

The plastic resin industry produces resins which are further treated in plastics processing facilities and sold largely to the packaging, building and construction, and consumer markets. Specific product formulations and manufacturing parameters are often kept as trade secrets since the competitiveness of many companies depends on the ability to produce resins with different physical characteristics, such as strength, toughness, and flexibility. [6]

Plastic resins are typically broken down into two categories: thermoplastics and thermosets. Thermoplastic resins are resins that can be heated and molded into shapes repeatedly, while thermoset resins are resins that can be heated and molded only once. Thermoplastic resins dominate plastic resin sales and production. In 1994, thermoplastics made up about 90 percent, or 63.3 billion pounds, of plastic resin production by dry weight and accounted for 82 percent, or $27.2 billion dollars of the total value of shipments for plastic resin. Commercially important thermoplastics include polyethylene (all forms), polyvinyl chloride, polypropylene, and polystyrene and are shown in Figure 3. These four thermoplastics make up over 69 percent of plastic resin sales. These thermoplastics are considered general purpose, or commodity plastics since they are usually manufactured in large quantities using well established technology and are typically geared towards a small number of high volume users. [7]

6.1.2.1.1 Production and Shipment Values

Table 6-11 shows the estimated U.S. total value of shipments for plastic material and resins for 1997.

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[5] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC*

[6] EPA. 1995. EPA Office of Compliance Sector Notebook Project: *Profile of the Plastic Resin and Manmade Fiber Industry*. EPA/310-R-97-006

[7] Ibid

Table 6-11. Estimated United States Total Value of Shipments of Plastic Materials and Resin Products: 1997	
YEAR	**TOTAL VALUE OF SHIPMENTS ($1,000)**
1997	44,574,918
Source: 1997 Census of Manufacturers, USDC.	

6.1.2.1.2 Industry Size and Market Share

Data used to characterize the plastic material and resin manufacturing industry are from the 1997 Census of Manufacturers. The 1997 Census data indicate that there are 532 facilities located in the U.S., owned by 301 companies. Over 70 percent of the of all facilities employ fewer than 100 people. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-12.

Table 6-12. Distribution of Facilities by Employment for the Plastics Material and Resin Manufacturing Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
1- 19	115	21.6%	1.5%
20 - 49	160	30.1%	6.9%
50 -99	114	21.4%	12.1%
100 - 249	94	17.7%	28.1%
250 & above	49	9.2%	34.4%
Total	**532**	100.0%	83.0%
Source: 1997 Census of Manufacturers, USDC.			

6.1.2.1.3 Typical Products

Important products of this industry include: cellulose plastics materials; phenolic and other tar acid resins; urea and melamine resins; vinyl resins; styrene resins; alkyd resins; acrylic resins; polyethylene resins; polypropylene resins; rosin modified resins; coumarone-indene and petroleum polymer resins; miscellaneous resins, including polyamide resins, silicones, polyisobutylenes, polyesters, resins, acetyl resins, and fluorohydrocarbon resins; and casein plastics. polycarbonate

resins, acetyl resins, and fluorohydrocarbon resins; and casein plastics. [8]

6.1.2.1.4 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $170,472,000.

6.1.3 Pharmaceutical and Medicine Manufacturing

The Pharmaceutical and Medicine Manufacturing Industry (NAICS 3254) contains a broad range of industries. For the purpose of this analysis the Pharmaceutical Preparations Industry will be examined.

6.1.3.1 Pharmaceutical Preparations Industry Profile

Pharmaceutical preparations manufacturers are listed under the North American Industrial Classification NAICS code as 325412 (SIC 2834 and 2835). This industry is a part of the chemical manufacturing industry (NAICS 325). The pharmaceutical preparations industry is made up of companies that manufacture, fabricate, and process raw materials into pharmaceutical preparations for human and veterinary uses. Finished products are sold in various dosage forms including, for example, tablets, capsules, ointments, solutions, suspensions, and powders. These are 1) preparations aimed for use mainly by dental, medical, or veterinary professionals, and 2) those aimed for use by patients and the general public.[9]

6.1.3.1.1 Shipment Values

The total value of shipments for pharmaceutical preparations in the United States totaled $78.9 billion in 2000, a 12-percent increase from $70.2 billion in 1999. The leading product category was pharmaceutical preparations that act on the central nervous system and sense organs in humans. Table 6-13 provides a summary of estimated U.S. total value of shipments for pharmaceutical preparations.[10]

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[8] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC*

[9] EPA. 1995. EPA Office of Compliance Sector Notebook Project: *Profile of the Pharmaceutical Industry*. EPA/310-R-97-005

[10] U.S. Department of Commerce, Bureau of the Census, Current Industrial Reports, *Pharmaceutical Preparations, Except Biologicals, Annual Report 2000*, MA 325G(00)-1, August 2001.

Table 6-13. Estimated United States Total Value of Shipments of Pharmaceutical Preparations, Except Biologicals: 2000 and 1999				
YEAR	**VALUE OF SHIPMENTS ($1,000)**			
	Total	**Prescription legend**	**Non-prescription**	**Bulk Shipments**
2000	78,907,599	63,768,674	13,999,294	1,139,631
1999	70,171,309	54,669,894	14,411,968	1,089,447
Source: U.S. Department of Commerce, Bureau of the Census, Current Industrial Reports, *Pharmaceutical Preparations, Except Biologicals, Annual Report 2000,* MA 325G(00)-1, August 2001.				

6.1.3.1.2 Industry Size and Market Share

Data used to characterize the pharmaceutical preparations industry are from the 1997 Census of Manufacturers and Census Current Industrial reports. The 1997 Census data indicate that there are 837 facilities located in within the U.S., owned by 710 companies. More than half of this industry, in terms of aggregate value of shipments, is dominated by only 6 percent of all facilities. Over 70 percent of all facilities employ fewer than 100 people. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-14.

Table 6-14. Distribution of Facilities by Employment for the Pharmaceutical Preparations Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
1- 19	395	47.2%	1.0%
20 - 49	138	16.5%	1.6%
50 -99	85	10.2%	3.7%
100 - 249	107	12.8%	11.6%
250 & above	112	13.3%	82.1%
Total	**837**	100.0%	100.0%
Source: 1997 Census of Manufacturers, USDC.			

6.1.3.1.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the

industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $258,378,000.

6.1.4 Nonferrous Metal (except Aluminum) Production and Processing Industry Profile

The nonferrous metal production and processing industry includes a broad range of industries. For the purpose of this analysis we will be focusing on: Primary Smelting and Refining of Copper (NAICS 331411), Other Nonferrous Metal Primary Smelting and Refining (NAICS 331419), Secondary Smelting, Refining and Alloying of Copper (NAICS 331423), and Other Nonferrous Metals Smelting, Refining and Alloying (NAICS 331492).

6.1.4.1 Primary Smelting and Refining of Copper Industry Profile

This industry is listed under the NAICS code 331411 (SIC 331). This industry is a subsector of the primary metal industry (NAICS 331). This industry comprises establishments primarily engaged in (1) smelting copper ore and/or (2) the primary refining of copper by electrolytic methods or other processes.[11]

6.1.4.1.1 Production and Shipment Values

Table 6-15 shows the estimated US total value of shipments for primary smelting an refining of copper products for 1997.

Table 6-15. Estimated United States Total Value of Shipments of Primary Smelting and Refining of Copper Products: 1997

YEAR	TOTAL VALUE OF SHIPMENTS ($1,000)
1997	6,540,441

Source: 1997 Census of Manufacturers, USDC.

6.1.4.1.2 Industry Size and Market Share

Data used to characterize this industry are from the 1997 Census of Manufacturers. The 1997 Census data indicate that there are 16 facilities located in the U.S., owned by 9 companies. A

[11] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC*

distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-16.[12]

Table 6-16. Distribution of Facilities by Employment for the Primary Smelting and Refining of Copper Industry

Employees Per Facility	Number of Facilities	Percent of Facilities	Percent of Total Shipments Value
1- 19	1	6.2%	N/A
20 - 49	1	6.2%	N/A
50 -99	0	0.0%	N/A
100 - 249	3	18.8%	N/A
250 - 499	11	68.8%	81.8%
Total	**16**	100.0%	100.0%

Source: 1997 Census of Manufacturers, USDC.

6.1.4.1.3 Typical Products

Establishments in this industry primarily make primary copper and copper based alloys, such as brass and bronze, from ore or concentrates.[13]

6.1.4.1.4 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $521,876,000.

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[12] 1997 Census of Manufacturers, USDC

[13] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC*

6.1.4.2 Other Nonferrous Metal Primary Smelting and Refining Industry Profile

This industry is listed under the NAICS code 331419 (SIC 3339). This industry is a subsector of the primary metal industry (NAICS 331). This industry comprises establishments primarily engaged in (1) making (i.e., the primary production) nonferrous metals by smelting ore and/or (2) the primary refining of nonferrous metals by electrolytic methods or other processes.[14]

6.1.4.2.1 Production and Shipment Values

Table 6-17 shows the estimated US total value of shipments for other nonferrous metal primary smelting and refining products for 1997.

Table 6-17. Estimated United States Total Value of Shipments of Other Nonferrous Metal Primary Smelting and Refining Products: 1997

YEAR	TOTAL VALUE OF SHIPMENTS ($1,000)
1997	3,538,056

Source: 1997 Census of Manufacturers, USDC.

6.1.4.2.2 Industry Size and Market Share

Data used to characterize this industry are from the 1997 Census of Manufacturers. The 1997 Census data indicate that there are 141 facilities located in the U.S., owned by 128 companies. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-18.[15]

Table 6-18. Distribution of Facilities by Employment for the Other Nonferrous Metal Primary Smelting and Refining Industry

Employees Per Facility	Number of Facilities	Percent of Facilities	Percent of Total Shipments Value
1- 19	76	53.9%	3.2%
20 - 49	21	14.9%	10.2%
50 -99	18	12.8%	11.6%
100 - 249	13	9.2%	19.3%

[14] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC*

[15] 1997 Census of Manufacturers, USDC

Table 6-18. Distribution of Facilities by Employment for the Other Nonferrous Metal Primary Smelting and Refining Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
250 - 499	13	9.2%	55.7%
Total	**141**	100.0%	100.0%
Source: 1997 Census of Manufacturers, USDC.			

6.1.4.2.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $74,719,000.

6.1.4.3 The Secondary Smelting, Refining and Alloying of Copper Industry Profile

The secondary smelting, refining and alloying of copper are listed under the NAICS code 331423. This industry is a subsector of the primary metal industry (NAICS 331). This industry comprises establishments primarily engaged in recovering copper and copper alloys from scrap and/or alloying purchased copper.[16]

6.1.4.3.1 Production and Shipment Values

The secondary smelting, refining, and alloying of copper manufacturers industry produces primary forms, such as ingot, wire bar, cake, and slab from copper or copper alloys, such as brass and bronze.[17] According to the Bureau of Mines, U.S. consumption of copper in 1992 was about 2.2 million tons. Consumption rose sharply in 1993 and 1994 to almost 2.7 million tons and is expected to continue to increase throughout the 1990s due to a growing foreign market. However, in 1991, the consumption of refined copper in the U.S. decreased by four percent from 1990 levels.[18] Table 6-19 shows the estimated US total value of shipments for the products in this industry for 1997.

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[16] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC*

[17] 1997 Census of Manufacturers, USDC.

[18] EPA. 1995. EPA Office of Compliance Sector Notebook Project: Profile of the Nonferrous Metal Industry EPA/310-R-95-010.

Table 6-19. Estimated United States Total Value of Shipments of Secondary Smelting, Refining, and Alloying of Copper Products: 1997	
YEAR	**TOTAL VALUE OF SHIPMENTS ($1,000)**
1997	1,269,088
Source: 1997 Census of Manufacturers, USDC.	

6.1.4.3.2 Industry Size and Market Share

Data used to characterize this industry are from the 1997 Census of Manufacturers. The 1997 Census data indicate that there are 35 facilities located in the U.S., owned by 34 companies. Over 75 percent of all facilities employ fewer than 100 people.[19] A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-20. The secondary copper industry is concentrated in South Carolina, Georgia, Illinois, and Missouri.[20]

Table 6-20. Distribution of Facilities by Employment for the Secondary Smelting, Refining and Alloying of Copper Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
1- 19	6	17.1%	N/A
20 - 49	12	34.3%	12.3%
50 -99	9	25.7%	31.0%
100 - 249	8	22.9%	54.9%
Total	**35**	100.0%	100.0%
Source: 1997 Census of Manufacturers, USDC.			

6.1.4.3.3 Typical Products

The secondary smelting, refining, and alloying of copper manufacturers industry produces primary forms, such as ingot, wire bar, cake, and slab from copper or copper alloys, such as brass and bronze. In the secondary production of copper, scrap metal goes through pretreatment and

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[19] 1997 Census of Manufacturers, USDC.

[20] EPA. 1995. EPA Office of Compliance Sector Notebook Project: Profile of the Nonferrous Metal Industry EPA/310-R-95-010.

smelting. Pretreatment can be accomplished through several different methods, two of which are the hydrometallurgical method and the pyrometallurgical method. Hydrometallurgical technologies differ from pyrometallurgical processes in that the desired metals are separated from undesirable metals using techniques that capitalize on differences between constituent solubilities and/or electrochemical properties while in aqueous solutions. After pretreatment the scrap goes through the smelting process. Within the United States, the leading end users of copper and copper alloy are the construction and electronic products industry. Transportation equipment also accounts for a fair amount of copper end-usage at 11.6 percent.[21]

6.1.4.3.4 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $68,807,000.

6.1.4.4 Other Nonferrous Metal Secondary Smelting, Refining, Alloying Manufacturing Industry Profile

The other nonferrous metal secondary smelting, refining, and alloying manufacturers are listed under the NAICS code 331492 (SIC 3341). This industry is a subsector of the primary metal industry (NAICS 331). This industry comprises establishments primarily engaged in alloying purchased nonferrous metals and/or recovering nonferrous metals from scrap.[22]

6.1.4.4.1 Production and Shipment Values

The secondary smelting, refining, and alloying of nonferrous metal manufacturers industry produces primary forms (e.g., bar, billet, bloom, cake, ingot, slab, slug, wire) using smelting or refining processes.[23] Table 6-21 shows the estimated US total value of product shipments.

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[21] EPA. 1995. EPA Office of Compliance Sector Notebook Project: Profile of the Nonferrous Metal Industry EPA/310-R-95-010.

[22] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC*

[23] 1997 Census of Manufacturers, USDC.

Table 6-21. Estimated United States Total Value of Shipments of Other Nonferrous Metal Secondary Smelting, Refining, Alloying Products: 1997	
YEAR	**TOTAL VALUE OF SHIPMENTS ($1,000)**
1997	3,750,387
Source: 1997 Census of Manufacturers, USDC.	

6.1.4.4.2 Industry Size and Market Share

Data used to characterize this industry are from the 1997 Census of Manufacturers. The Census data indicate that there are 252 facilities located in the U.S., owned by 236 companies. Over 85 percent of all facilities employ fewer than 100 people.[24] A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-22.

Table 6-22. Distribution of Facilities by Employment of the Other Nonferrous Metal Secondary Smelting, Refining, Alloying Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
1- 19	148	58.7%	8.2%
20 - 49	48	19.0%	13.5%
50 -99	25	9.9%	14.9%
100 - 249	23	9.1%	46.3%
250 - 500	6	2.4%	N/A
500 & above	2	0.9%	N/A
Total	**252**	100.0%	100.0%
Source: 1997 Census of Manufacturers, USDC.			

6.1.4.4.3 Typical Products

The secondary smelting, refining, and alloying of nonferrous metal manufacturers industry produce primary forms (e.g., bar, billet, bloom, cake, ingot, slab, slug, wire) using smelting or refining processes. In the secondary production of nonferrous metals, metals are produced from scrap and waste. Two metal recovery technologies are used to make refined metals, pyrometallurgical technology and the hydrometallurgical technology. The four most widely used nonferrous metals in the United States are aluminum, copper, lead, and zinc. Within the United States, the leading end users of nonferrous metals include the automotive industry, the construction industry, the power storage battery industry, and the electrical and machinery

[24] 1997 Census of Manufacturers, USDC.

industry.[25]

6.1.4.4.4 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $56,266,000.

6.1.5 Coating, Engraving, Heat Treating, and Allied Activities

The Coating, Engraving, Heat Treating and Allied Activities Industry (NAICS 3328) contains a broad range of industries. For the purpose of this analysis, The Plating and Polishing Industry will be profiled.

6.1.5.1 Plating and Polishing Industry Profile

The plating and polishing industry is listed under the NAICS code for Paints and Coatings as 332813 (SIC 3471). This industry is a sub-sector of the fabricated metal product manufacturing industry (NAICS 332). The plating and polishing industry is primarily engaged in all types of electroplating, plating, anodizing, coloring, and finishing of metals and formed products for the trade. Also included in this industry are establishments which perform these types of activities, on their own account, on purchased metals or formed products.[26]

6.1.5.1.1 Production and Shipment Values

Table 6-23 shows the estimated US total value of shipments for plating and polishing products.

Table 6-23. Estimated United States Total Value of Shipments of Plating and Polishing Products: 1997

YEAR	TOTAL VALUE OF SHIPMENTS ($1,000)
1997	5,940,626

Source: 1997 Census of Manufacturers, USDC.

6.1.5.1.2 Industry Size and Market Share

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[25] EPA. 1995. EPA Office of Compliance Sector Notebook Project: Profile of the Nonferrous Metal Industry EPA/310-R-95-010.

[26] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC.*

Data used to characterize the plating and polishing industry are from the 1997 Census of Manufacturers. The 1997 Census data indicate that there are 3,399 facilities located in the U.S., owned by 3,282 companies. Over 95 percent of all facilities employ fewer than 100 people. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-24.

Table 6-24. Distribution of Facilities by Employment for the Plating and Polishing Industry

Employees Per Facility	Number of Facilities	Percent of Facilities	Percent of Total Shipments Value
36178	2349	69.1%	19.0%
20-49	674	19.8%	25.6%
50-99	268	7.9%	27.3%
100-249	94	2.8%	20.2%
250 & above	14	0.4%	7.9%
Total	**3399**	100.0%	100.0%

Source: 1997 Census of Manufacturers, USDC.

6.1.5.1.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $9,392,000.

6.1.6 Semiconductor and Other Electronic Component Manufacturing

The Semiconductor and Other Electronic Component Manufacturing Industry (NAICS 3344) contains a broad range of industries. For the purpose of this analysis, The Printed Circuit Board Industry will be examined.

6.1.6.1 Printed Circuit Board Industry Profile

The printed circuit board industry is listed under the NAICS code as 334412 (and SIC 3672). The printed circuit board industry is a part of the computer and electronic product manufacturing industry (NAICS 334). This industry comprises establishments primarily engaged in manufacturing bare (i.e., rigid or flexible) printed circuit boards without mounted electronic components. These establishments print, perforate, plate, screen, etch, or photoprint

interconnecting pathways for electric current on laminates.[27]

6.1.6.1.1 Production and Shipment Values

Table 6-25 shows the estimated US total value of shipments for printed circuit wire boards.

Table 6-25. Value of Shipments of Printed Circuit Boards: 1995 - 2000 (Value in millions of dollars)

YEAR	TOTAL VALUE OF SHIPMENTS
2000	11,129
1999	9,150
1998	8,473
1997	8,702
1996	8,217
1995	8,367

Source: U.S. Department of Commerce, Bureau of the Census, Current Industrial Reports, *Inorganic Chemicals 1998*, MA 334Q(00)-1, September, 2001

6.1.6.1.2 Industry Size and Market Share

Data used to characterize the printed circuit board industry are from the 1997 Census of Manufacturers and the 2000 Census Current Industrial Report. The 1997 Census data indicate that there are 1,389 facilities located in the U.S., owned by 1,315 companies. Close to 90 percent of all facilities employ fewer than 100 people. A distribution of facilities by number of employees, and their respective share of the total value of shipments is provided in Table 6-26.

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[27] U.S. Department of Commerce, US Census Bureau, *1997 Economic Census: Bridge Between NAICS and SIC.*

Table 6-26. Distribution of Facilities by Employment for the Printed Circuit Board Industry			
Employees Per Facility	**Number of Facilities**	**Percent of Facilities**	**Percent of Total Shipments Value**
1-19	801	57.7%	5.2%
20-49	268	19.3%	8.3%
50-99	144	10.4%	11.5%
100-249	114	8.2%	22.6%
250 & above	62	4.4%	52.4%
Total	**1,389**	100.0%	100.0%
Source: 1997 Census of Manufacturers, USDC.			

6.1.6.1.3 Average Facility Size

Annual sales for the average facility was estimated assuming that the largest facilities in the industry were reporting BRS waste quantities. Using this assumption, we estimated average annual sales, based on 1997 Census data, updated to 2001 dollars using the GNP Implicit Price Deflator to be $25,240,000.

6.2 Facility Level Impacts

In this section an overview of facility level impacts is presented. Impacts are presented for average size facilities profiled in the previous section which reported waste generation in the 1999 Biennial Report database.

Facility revenues were estimated using Census of Commerce data from 1997, updated to 2002 dollars using the GDP Implicit Price Deflator. In order to approximate facility level revenues the assumption was made that only the largest facilities (in terms of revenue generation) would report waste in the BRS database.

Profitability for these facilities was estimated using data from Robert Morris Associates. Financial data were averaged over a 3-year period (1999-2001) for various sizes of facilities in terms of annual sales. All financial data were updated to a 2002 basis using the GDP Implicit Price Deflator. Profitability estimates were developed for various sizes of facilities, expressed as profit before taxes as a percent of sales. With average sales data developed using Census data (described above), profits before taxes were estimated for average size facilities.

Table 6-27 presents impacts from excluding reclaimed wastes from RCRA jurisdiction if reclaimed on-site or reclaimed off-site within the same Industry Group (4-digit NAICS). Impacts for each of the major industries presented are typically less than 0.1 percent of sales. Impacts on profitability are significantly larger, with profitability increasing by as much as 2.9 percent in

NAICS 3252 (Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing).

Table 6-27. Facility Impacts for Major Industry Groups (NAICS) 1/

NAICS	Number of Facilities Affected	Estimated Annual Average Sales 2/	Estimated Annual Profit Before Taxes 3/	Estimated Annual Average Cost Savings 4/	Cost Savings as a Percent of Sales 5/	Cost Savings as a Percent of Profits 6/
3251	302	$186,090,000	$11,537,000	$53,230	0.03%	0.46%
3252	112	$179,369,000	$6,458,000	$185,520	0.10%	2.87%
3254	124	$271,863,000	$31,264,000	$57,330	0.02%	0.18%
3312	152	$447,372,000	$16,085,000	$258,580	0.06%	1.61%
3314	105	$119,793,000	$4,911,000	$29,120	0.02%	0.59%
3328	431	$9,882,000	$514,000	$1,440	0.01%	0.28%
3344	464	$26,558,000	$1,062,000	$24,860	0.09%	2.34%
Other	1038	-	-	$40,770	-	-
NA	165	-	-	$165,900	-	-

NA- Not available from BRS
1/ Includes both 1999 and 1997 generators who recycled some portion of their waste. For off-site recovery, wastes recovered at facilities in the same Industry Group (4-digit NAICS) as the generator and off-site outside-generator-industry recycled wastes which are economical to recover on-site are included.
2/ Estimated average sales per large quantity generator reporting waste generation in BRS. Calculated as the average value of shipments for the facilities with more than 50 employees as reported in 1997 Census (updated to 2002 $).
3/ Average 3-year profits in 2002 $ based on Robert Morris Associates data (1998-2000)
4/ Based on cost calculations presented in Chapter 5
5/ Annual average cost savings divided by annual average sales
6/ Annual average cost savings divided by annual average profits

In addition to these cost savings there will likely be additional savings as facilities in other industries which were not explicitly considered will recycle wastes which are currently disposed. The volume of additional waste which will be recycled will depend on the quality of the waste, especially the value/concentration of the recovered component. Accordingly the above estimates likely understate the total cost-reducing impacts.

6.3 Distributional Impacts

In addition to the impacts presented in the previous sections there will also be certain distributional impacts, especially resulting from changes in taxes levied on the generation of hazardous waste. State imposed hazardous waste generation taxes and fees have been identified for facilities located in 27 states. These state taxes and fees are listed in Appendix F.

Table 6-28 presents a summary of the estimated decreases in tax revenue resulting from the hazardous waste generation taxes. In total, waste generation taxes will decline by approximately $12.2 million for the 27 states analyzed. In addition to the waste generation distributional impacts there will be other distributional impacts stemming from increased corporate income taxes which have not been quantified. No tax effect is included for wastes that are currently being disposed but may be recovered post-rule due to the uncertainties about the quality of waste and the total amount which would be recovered.

Table 6-28. Estimated Changes in Hazardous Waste Generation Tax Revenues

State 1/	Total Decrease in State Tax Revenue ($/yr)	Number Facilities with Tax Decrease	Average Savings per Facility ($/yr)
AR	1,000	1	626
AZ	13,835	21	5,879
CA	2,046,553	47	7,516
CO	19,696	16	1,231
CT	4,678	12	390
GA	29,520	29	1,018
ID	18,152	3	6,051
KS	13,142	9	1,460
KY	104,775	37	2,832
ME	30,051	11	2,732
MN	2,560,691	47	54,483
MO	65,444	23	2,845
MS	2,500	1	2,500
MT	1,800	3	600
NC	10,603	37	287
NH	60,674	6	10,112
NJ	21,071	36	585
NM	23,070	2	11,535

Table 6-28. Estimated Changes in Hazardous Waste Generation Tax Revenues

State 1/	Total Decrease in State Tax Revenue ($/yr)	Number Facilities with Tax Decrease	Average Savings per Facility ($/yr)
NY	648,752	16	40,547
OK	11,754	6	1,959
OR	507,636	31	16,375
SC	538,023	19	28,317
TN	4,500	4	1,125
TX	229,288	61	3,759
VA	9,021	4	2,255
WA	678	15	45
WI	10,707	23	466
	6,987,614	520	13,438

1/ Estimates are not included for DE, IL, NE, NV, OH, and WV where further analysis needs to be conducted to determine tax rates. In addition, all potential taxes are not included in the estimates for NY and TX where further analysis is needed to determine tax rates.

7.0 BENEFITS

Providing exclusions from the RCRA Definition of Solid Waste to generators of metal-bearing, solvent, and other wastes (e.g., acid) that recover wastes either on-site or within the same industry, provides an economic incentive for more generators to recover metals, solvents, and acids from wastes instead of placing it in a landfill, reusing it as fuel, or neutralizing the acid and discharging it as wastewater, respectively. In addition, it provides an incentive to generators recovering wastes to continue the practice in markets with fluctuating product values (e.g., metal prices). Also, depending on the recovery technology implemented, such as, ion exchange, it may promote recycling treated wastewater back into process units. Increased recovery of metals, solvents and other values, such as acid, and treated wastewater may result in a net benefit to both society and the environment.

7.1 Qualitative Benefits

Some of the expected benefits include the following:

- Landfill Capacity: Approximately 23 million tons of hazardous waste are land disposed annually. In 1995, 1 million tons of the land disposed hazardous waste were disposed in landfills along with 208 million tons of municipal waste.[28] Available landfill space is limited and as overcapacity issues are eminent, any increase in recycling will lessen the future burden on landfills.

- Resource Conservation: The supply of metals used in processes such as electroplating are ultimately fixed by nature. Many metals are easily recycled and today recycled metals make up a large portion of the available metals supply. For instance, the U.S. Geological Survey reported that in 1996, 78 million metric tons of metals were recycled in the U.S. The value of these recycled metals was estimated to be approximately $18 billion.[29] As the U.S. Geological Survey states, "Recycling, a significant factor in the supply of many of the key metals used in our society, provides environmental benefits in terms of energy savings, reduced volumes of waste, and reduced emissions. These reductions, in turn, result in reduced disturbance to land, reduced pollution, and reduced energy use."[30]

- Resource Conservation: In some portions of the United States water is scarce. Technologies such as ion exchange remove metal and other ions from wastewater to concentrations below levels typically achieved by metals precipitation technologies. Treated wastewater from ion exchange technologies can be reused in the electroplating

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[28] U.S. EPA, Office of Solid Waste and Emergency Response, "RCRA: Reducing Risk From Waste OSWER," EPA530-K-97-004, September 1997, pp 14-15.

[29] U.S. Geological Survey–Minerals Information, "Recycling–Metals," 1996, p.1.

[30] Ibid.

process reducing demand on scarce water resources.

- Metal Recovery: An increase in recycling of domestic metals will lessen the dependance of the United States on foreign metal supplies. In 1991, the United States ran a $9.8 billion balance of trade deficit for metal commodities.[31] Copper, nickel, and zinc, three of the most common metals recovered from electroplating waste, accounted for more than $2 billion of this total. Additionally, several metal recyclers of F006 waste, which is one of many potential wastes affected by the proposed rule, reported that metal recovery of nickel, chromium and zinc bearing secondary materials was more efficient in terms of conserving energy, and reducing solid waste residuals associated with primary metal/mineral production. Finally, in its Report to Congress on Metal Recovery, Environmental Regulation and Hazardous Waste, EPA reported that chromium, a strategic metal,[32] is found in sources of secondary materials such as electroplating waste. The report also indicates that these secondary materials are underutilized as a potential source of secondary chromium to reduce U.S. dependence on foreign primary sources.[33] [34]

- Solvent/Acid Recovery: An increase in the recovery of solvents/acids on site will reduce the amount of energy used and feedstock material used to produce and transport virgin solvents and acids.

7.2 Quantitative Benefits

The following salvage value estimates were derived only considering waste currently recovered in 1999 and waste previously recovered in 1997. These salvage values (revenues) are included in the cost estimates in Section 5. The estimates do not take into consideration that there will be additional benefits beyond those quantified as generators recycle more and more of their waste as a result of the rule.

- **Value of Recovered Metal Products:** In 1999, plants affected by this rulemaking reported recovering 409,315 tons of metal-bearing waste on site and 18,647 tons off site within the same Industry Group. In addition an estimated 168,695 tons of metal-bearing waste are recovered off-site in other industries, which may be recovered on-site due to the

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[31] Based on the difference between imports and exports of each commodity as reported in Jacqueline A. McClaskey and Stephen D. Smith, "Survey Methods and Statistical Summary of Nonfuel Minerals," U.S. Department of the Interior, Bureau of Mines, 1991. As reported, supra, Note 38, USEPA, p.134.

[32] A strategic metal is a metal which is required for critical military and/or civilian use and for which the United States is dependent upon from vulnerable sources of supply. As reported, Borst, Paul A., "Recycling of Wastewater Treatment Sludges From Electroplating Operations, F006," USEPA, OSW.

[33] Supra, Note 38, pp. 138-139.

[34] Borst, Paul A., "Recycling of Wastewater Treatment Sludges From Electroplating Operations, F006," USEPA, OSW.

potential rule change if it is economically feasible to construct on-site recovery facilities. In the analysis, it is assumed that these recovered wastes contain 20 percent recoverable metals. At a $4,770 per ton average market price (assuming a 90 percent assay value) for copper, chromium, and nickel, the estimated metal value is $569 million. This proposed rule encourages these plants to continue recovering these metals and maintaining these benefits.

Plants that reported recovering wastes in 1997 and not in 1999 recovered 2,778 tons of metal-bearing waste on site and 229 tons off site within the same Industry Group. The estimated metal value is $2.9 million. In addition, facilities that dispose two waste types (48,235 tons of emission control dust - K061, 19,108 tons of metal-containing liquids from the printed circuit board industry, and 10,869 tons of spent catalyst from the petroleum refining industry - K171/K172) are estimated to switch over to on-site recovery. In the analysis, it is assumed that these recovered emission control dust wastes contain 15 percent recoverable zinc at $643 per ton (assuming a 90 percent assay value), the metal-containing liquids contain 0.02 percent copper at $1,397 per ton (assuming a 90 percent assay value), and the spent catalyst contains five percent molybdenum at $23,940 per ton (assuming a 90 percent assay value). The estimated metal value from these disposed wastes is $17.7 million. This proposed rule may encourage these new benefits.

The total estimated recovered metal value is $590 million.

- **Value of Recovered Solvent Products:** In 1999, plants affected by this rulemaking reported recovering 160,119 tons of solvent waste on site and 35,585 tons off site within the same Industry Group. In addition an estimated 72,040 tons of solvent-bearing waste are recovered off-site in other industries, which may be recovered on-site due to the potential rule change if it is economically feasible to construct on-site facilities. In the analysis, it is assumed that these recovered wastes contain 67 percent of recoverable solvents. At a $1,542 per ton average market price for solvents, assuming 90 percent effectiveness, the estimated solvent value is nearly $277 million. This proposed rule encourages these plants to continue recovering these solvents and maintaining these benefits.

  Plants that reported recovering wastes in 1997 and not in 1999 recovered 8,448 tons of solvent waste on site and 4,031 tons off site within the same Industry Group. The estimated solvent value is $12.9 million if these facilities choose to switch back to solvent recovery instead of off-site energy recovery. This proposed rule may encourage these new benefits.

  The total estimated recovered solvent value is $290 million.

- **Value of Other Recovered Products (Acids and Fluoride):** In 1999, plants affected by this rulemaking reported recovering 248,914 tons of “other” waste on site and 5,205 tons

off site within the same Industry Group. In addition an estimated 15,952 tons of other waste are recovered off-site in other industries, which may be recovered on-site due to the potential rule change. In the analysis, it is assumed that these recovered wastes contain 74 percent recoverable acids. At a $298 per ton average market price for acid, assuming 90 percent effectiveness, the estimated acid value is over $60 million. Other wastes were primarily acids. This proposed rule encourages these plants to continue recovering these acids and maintaining these benefits.

Plants that reported recovering wastes in 1997 and not in 1999 recovered 16,318 tons of other (acid) waste on site and 245 tons off site within the same Industry Group. The estimated acid value is $3.7 million if these facilities choose to switch back to acid recovery instead of on-site acid neutralization. In addition, facilities that dispose two waste types (71,698 tons of spent aluminum potliner, K088, and 254,109 tons of spent pickle liquor from the steel works industry) are estimated to switch over to on-site recovery. In the analysis, it is assumed that these recovered spent aluminum potliner wastes contain two percent recoverable fluoride at $1,240 per ton and the spent pickle liquor contains 74 percent recoverable acids at $298 per ton (assuming a 90 percent assay value). The estimated metal value from these disposed wastes is $57.8 million. This proposed rule may encourage these new benefits.

The total estimated recovered acid and fluoride value is $122 million.

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Appendix A

Co-Proposal Option for the Regulatory Modifications to the Definition of Solid Waste for the Association of Battery Recyclers Notice of Proposed Rulemaking

This appendix presents the estimated cost savings (economic benefits) for a regulatory option referred to as the Co-Proposal Option. Under the Co-Proposal Option hazardous wastes will be excluded from RCRA jurisdiction if the hazardous wastes shipped off site for recovery are transferred within the same Industry Group (4-digit NAICS code) and the recovery facility does not recover wastes from other (multiple) Industry Groups. For example if a primary lead smelter receives refractory brick for recovery from other mineral processing industries and lead acid batteries from another industry they would not be granted the exclusion from RCRA. If the primary lead smelter elects to no longer receive the lead acid batteries for recovery they would be granted the exclusion given that all transfers would now be within the same industry. However, it is not assumed that the economic benefits gained from the proposed ABR regulation will be greater than the values recovered from the lead acid batteries. In this analysis, it is assumed that the primary lead smelter will continue to receive wastes for recovery from multiple industries and not gain the RCRA exclusion under the ABR proposed rule. The primary lead smelter would be excluded from the population of facilities impacted by the proposed rule.

Biennial Report data were used in this analysis. Hazardous wastes transferred off-site within the same 4-digit NAICS code for recovery were kept in the analysis. This subset of recovery facilities were further analyzed to determine if they received shipments from more than one 4-digit NAICS code. Facilities that received waste shipments for recovery from multiple 4-digit NAICS codes were not included in the analysis under the Co-Proposal Option.

Below is a table presenting the cost estimate for the Co-Proposal Option. As discussed in the main body of the report, additional cost savings may be achieved if facilities elect to construct on-site recovery units instead of shipping wastes either off site for recovery at a non-same 4-digit NAICS code facility (approximately $63 million) or dispose a potentially recoverable waste either on or off site (approximately $81 million). If facilities construct on-site recovery units they qualify for the exclusion under the Co-Proposal Option.

	Co-Proposal Option Incremental Costs (2002 $)	
	Quantity (tons)	**Total Costs ($/year)**
On-Site Recovery - 1999	818,348	($10,962,000)
On-Site Recovery - 1997	27,544	($16,151,000)
Off-Site Recovery Within Industry Group - 1999	26,069	($419,000)
Off-Site Recovery Within Industry Group - 1997	1,059	($905,000)

	Co-Proposal Option Incremental Costs (2002 $)	
	Quantity (tons)	**Total Costs ($/year)**
Off-Site Recovery Outside Industry Group Switch to On-site Recovery - 1999	257,743	($63,346,000)
On-Site/Off-Site Disposal Switch to On-Site Recovery for Four Waste Types (K061, K062, K088, and metal-containing liquids from printed circuit board industry)	404,019	($80,827,000)
Total	**1,534,782**	**($172,610,000)**
Note: Numbers in parentheses, "( )", represent negative costs that reflect revenues or cost savings.		

1999 Off-site Recovery Quantity

A total of 26,000 tons of hazardous waste were recovered off site in 1999 within the same 4-digit NAICS by 32 plants within 17 NAICS codes. One NAICS code recovered greater than 14,000 tons of solvents within the same 4-digit NAICS code. This NAICS code accounts for 56 percent of the total quantity recovered off site. Metals recovery, solvents recovery, and other recovery account for 8,000 tons, 15,600 tons, and 2,600 tons of the total, respectively. Table A-1 presents the quantity of hazardous waste managed off site by NAICS code and recovery management type for all NAICS codes.

NAICS 3254, pharmaceutical and medicine manufacturing, recovered 14,500 tons (55.5 percent) of the total off-site recovery quantity. All of this quantity was managed by solvents recovery.

NAICS 3312, steel product manufacturing from purchased steel, recovered 6,700 tons (25.8 percent) of the total off-site recovery quantity. All of this quantity was managed by metals recovery.

NAICS 3252, resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing, recovered 2,400 tons (9.3 percent) of the total off-site recovery quantity. All of this quantity was managed by other recovery.

NAICS 3314, nonferrous metal (except aluminum) production and processing, recovered 730 tons (2.8 percent) of the total off-site recovery quantity. All of this quantity was managed by metals recovery.

NAICS 3363, motor vehicle parts manufacturing, recovered 690 tons (2.6 percent) of the total

off-site recovery quantity. All of this quantity was managed by solvents recovery.

NAICS 3251, basic chemical manufacturing, recovered 510 tons (2.0 percent) of the total off-site recovery quantity. This quantity was managed by solvents recovery and other recovery.

NAICS 6113, colleges, universities, and professional schools, recovered 420 tons (1.6 percent) of the total off-site recovery quantity. Nearly all of this quantity was managed by metals recovery.

The remaining 10 NAICS codes that recover less than 30 tons off-site in 1999 account for 95 tons (0.36 percent) of the total off-site recovery quantity.

Potential Additional Recovery Quantity (1997 Off-site Recovery Quantity)

Approximately 1,000 tons of hazardous waste were recovered off-site in 1997 but not in 1999 within the same Industry Group (4-digit NAICS) by 8 plants within 4 NAICS codes. Facilities that recovered their waste in 1997 and not in 1999 potentially may return to recovering their waste under the proposed rule.

One NAICS code recovered 950 tons in 1997 off-site but not in 1999. This NAICS code accounts for 90 percent of the total quantity recovered off site. Metals recovery, solvents recovery, and other recovery account for 16 tons, 819 tons, and 225 tons of the total, respectively. Table A-2 presents the quantity of hazardous waste managed off-site by NAICS code and recovery management type.

NAICS 3251, basic chemical manufacturing, recovered 950 tons (89.7 percent) of the total off-site recovery quantity. Nearly all of this quantity was managed by solvents recovery and other recovery.

NAICS 3312, steel product manufacturing from purchased steel, recovered 94 tons (8.9 percent) of the total off-site recovery quantity. All of this quantity was managed by other recovery.

NAICS 5417, scientific research and development services, recovered 15 tons (1.4 percent) of the total off-site recovery quantity. All of this quantity was managed by other recovery.

NAICS 3314, nonferrous metal (except aluminum) production and processing, recovered less than 1 ton of the total off-site recovery quantity. This quantity was managed by metals recovery.

Summary of Potential Cost Savings

Incremental cost savings (post-rule costs minus pre-rule costs) were estimated for the total number of plants currently recovering wastes in 1999 or recovered wastes in 1997. These plants reclaim metal, solvent and other values from 873,000 tons of waste. The sum of the pre-rule costs, post-rule costs, and incremental cost savings for all plants are presented in Table A-3 by individual unit cost item.

The potential incremental annual cost savings range from $12 million if only 1999 plants benefit to $28 million if the plants that recovered wastes in 1997 and not in 1999 switch back to recovery.

For the 1999 on-site recovery plants, the total estimated annual cost savings is $11 million. This total includes one-time (first year) contingency planning cost savings of $0.8 million that likely are sunk and one-time notification of exclusion costs of $0.5 million. The greatest annual savings result from a portion of the residual quantity generated by the recovery processes being classified as nonhazardous ($5.3 million in residual hazardous waste landfill cost savings - $3.0 million in new non-hazardous waste landfill costs + $2.3 million in nonhazardous transportation cost savings = $4.6 million in cost savings). The second largest annual cost savings is from a reduction in hazardous materials training costs ($2.8 million in cost savings). The third largest annual cost savings is from a reduction in waste characterization testing costs ($2.1 million).

For the 1997 on-site recovery plants, the total estimated annual cost savings is $16.2 million. This total includes one-time (first year) contingency planning cost savings of $0.2 million that likely are not sunk because plants are switching management technologies and one-time notification of exclusion costs of $0.2 million. The greatest annual savings result from a portion of the residual quantity generated by the recovery processes being classified as nonhazardous ($4.3 million in pre-rule baseline management costs - $1.5 million in post-rule residual hazardous waste landfill costs - $0.2 million in post-rule non-hazardous waste landfill costs - $8.0 million in post-rule recovery system costs + $2.0 million in nonhazardous transportation cost savings + $16.9 million in value from the recovered products = $13.5 million in cost savings). The second largest annual cost savings is from a reduction in waste characterization testing costs ($1.7 million). The third largest annual cost savings is from a reduction in hazardous materials training costs ($0.6 million).

For those 1999 plants that recovered wastes off-site within the same 4-digit NAICS, the total estimated annual cost savings is $0.4 million. The largest annual cost savings is from a reduction in the cost to transport wastes for recovery because of fewer shipments, i.e., longer storage times ($0.15 million in cost savings). The second largest annual savings result from a portion of the residual quantity generated by the recovery processes being classified as nonhazardous ($0.28 million in residual hazardous waste landfill cost savings - $0.21 million in post-rule non-hazardous waste landfill costs + $0.06 million in nonhazardous transportation cost savings = $0.13 million in cost savings). The third largest annual cost savings is from a reduction in hazardous materials training costs ($0.07 million).

For those 1997 plants that recovered wastes off-site within the same 4-digit NAICS, the total estimated annual cost savings is $0.9 million. The greatest annual cost savings is from a portion of the residual quantity generated by the recovery processes being classified as nonhazardous ($0.32 million in pre-rule hazardous waste management costs - $0.11 million in post-rule residual hazardous waste landfill costs - $0.01 million in post-rule non-hazardous waste landfill costs - $0.22 million in post-rule recovery system costs + $0.04 million in post-rule nonhazardous transportation cost savings - $0.09 million in post-rule off-site recovery transport costs + $0.9 million in value from the recovered products = $0.83 million in cost savings). The second largest annual savings result from a reduction in waste characterization testing costs ($0.06 million in cost savings). There were no cost savings predicted that would result from a change in generator status from LQG to SQG, etc. (e.g., decreased training, BRS/general administrative duty, contingency planning, and initial characterization costs).

Table A-1
Co-Proposal Option: 1999 Offsite Recovery Within Same Industry Group (4-digit NAICS Code) (Tons)

NAICS	METALS RECOVERY					Total Metals	SOLVENTS RECOVERY					Total Solvents	OTHER RECOVERY			Total Other	TOTALS		
Code	M011	M012	M013	M014	M019	Recovery	M021	M022	M023	M024	M029	Recovery	M031	M032	M039	Recovery	Quantity	%	Cumulative %
3254						0	14,467					14,467				0	14,467	55.495	55.495
3312	6,734					6,734						0				0	6,734	25.832	81.327
3252						0						0	2,429			2,429	2,429	9.319	90.646
3314			489		242	730						0				0	730	2.802	93.448
3363						0	688					688				0	688	2.638	96.086
3251						0	389					389			121	121	510	1.957	98.043
6113				16	398	414	1					1				0	415	1.591	99.634
3372						0	29					29				0	29	0.111	99.745
3344				12	16	28					0	0				0	28	0.107	99.852
8129				17		17						0				0	17	0.064	99.916
3255						0	15					15				0	15	0.059	99.975
5622						0						0		4		4	4	0.016	99.991
9281	1				1	1						0				0	1	0.005	99.997
3399	0					0						0				0	0	0.002	99.998
3325						0	0					0				0	0	0.001	99.999
9241						0	0					0				0	0	0.001	100.000
3231						0						0		0		0	0	0.000	100.000
TOTAL	**6,735**	**0**	**489**	**45**	**657**	**7,925**	**15,589**	**0**	**0**	**0**	**0**	**15,589**	**2,429**	**4**	**121**	**2,555**	**26,069**	**100.000**	**—**

Table A-2
Co-Proposal Option: 1997 Offsite Recovery Within Same Industry Group (4-digit NAICS Code) (Tons)

NAICS	METALS RECOVERY					Total Metals	SOLVENTS RECOVERY					Total Solvents	OTHER RECOVERY			Total Other	TOTALS		
Code	M011	M012	M013	M014	M019	Recovery	M021	M022	M023	M024	M029	Recovery	M031	M032	M039	Recovery	Quantity	%	Cumulative %
3251		16				16	803				15	818			116	116	950	89.680	89.680
3312						0						0	94			94	94	8.873	98.552
5417						0	0					0			15	15	15	1.437	99.990
3314				0		0						0				0	0	0.010	100.000
TOTAL	**0**	**16**	**0**	**0**	**0**	**16**	**804**	**0**	**0**	**0**	**15**	**819**	**94**	**0**	**131**	**225**	**1,059**	**100.000**	**—**

Table A-3. Co-Proposal Option: Summary of Pre- and Post-Rule Costs and Incremental Costs							
Cost Item	**1999 Plants**			**1997 Plants**			**Total Costs ($/yr)**
	Pre-Rule Costs ($/yr)	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	**Pre-Rule Costs ($/yr)**	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	
On-site Recovery							
Residual Hazardous Landfill Disposal	$60,719,000	$55,431,000	($5,288,000)	$0	$1,525,000	$1,525,000	($3,763,000)
Residual Non-Hazardous Landfill Disposal	$0	$2,976,000	$2,976,000	$0	$165,000	$165,000	$3,141,000
1997 Pre-Rule Management (Hazardous Landfill, Energy Recovery, on-site Acid Neutralization)	$0	$0	$0	$4,257,000	$0	($4,257,000)	($4,257,000)
Pre-Rule and Post-Rule Metal/ Solvent/Acid Recovery	$167,814,000	$167,814,000	$0	$0	$7,953,000	$7,953,000	$7,953,000
Waste Characterization Testing	$24,026,000	$21,961,000	($2,065,000)	$3,245,000	$1,581,000	($1,664,000)	($3,729,000)
Manifesting	$3,701,000	$3,383,000	($318,000)	$500,000	$243,000	($257,000)	($575,000)
Loading	$4,371,000	$4,371,000	$0	$71,000	$224,000	$153,000	$153,000
Waste Transportation	$23,184,000	$20,903,000	($2,281,000)	$3,749,000	$1,734,000	($2,015,000)	($4,296,000)

Table A-3. Co-Proposal Option: Summary of Pre- and Post-Rule Costs and Incremental Costs							
Cost Item	**1999 Plants**			**1997 Plants**			**Total Costs ($/yr)**
	Pre-Rule Costs ($/yr)	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	**Pre-Rule Costs ($/yr)**	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	
Recovery Transportation	$0	$0	$0	$0	$0	$0	$0
Salvage Revenue	($610,881,000)	($610,881,000)	$0	$0	($16,898,000)	($16,898,000)	($16,898,000)
Hazardous Materials Training	$7,479,000	$4,719,000	($2,760,000)	$2,291,000	$1,659,000	($632,000)	($3,392,000)
Manifest Training	$1,539,000	$1,095,000	($444,000)	$459,000	$382,000	($77,000)	($521,000)
BRS/General Administrative Duties	$1,927,000	$1,423,000	($504,000)	$584,000	$473,000	($111,000)	($615,000)
One-Time Contingency Planning	$2,072,000	$1,252,000	($820,000)	$640,000	$442,000	($198,000)	($1,018,000)
Initial Characterization	$7,066,000	$7,066,000	$0	$1,805,000	$1,805,000	$0	$0
One-Time Notification of Exclusion	$0	$542,000	$542,000	$0	$162,000	$162,000	$704,000
On-site Recovery Subtotal	($306,983,000)	($317,945,000)	($10,962,000)	$17,601,000	$1,450,000	($16,151,000)	($27,113,000)
Off-site Recovery Within the Same Industry Group (4-Digit NAICS Code) and Recovery Facilities Do Not Receive Shipments From Multiple NAICS Codes							

Table A-3. Co-Proposal Option: Summary of Pre- and Post-Rule Costs and Incremental Costs							
Cost Item	1999 Plants			1997 Plants			Total Costs ($/yr)
	Pre-Rule Costs ($/yr)	Post-Rule Costs ($/yr)	Incremental Costs ($/yr)	Pre-Rule Costs ($/yr)	Post-Rule Costs ($/yr)	Incremental Costs ($/yr)	
Residual Hazardous Landfill Disposal	$2,424,000	$2,146,000	($278,000)	$0	$108,000	$108,000	($170,000)
Residual Non-Hazardous Landfill Disposal	$0	$211,000	$211,000	$0	$11,000	$11,000	$222,000
1997 Pre-Rule Management (Hazardous Landfill, Energy Recovery, On-site Acid Neutralization)	$0	$0	$0	$319,000	$0	($319,000)	($319,000)
Pre-Rule and Post-Rule Metal/ Solvent/Acid Recovery Cost	$3,896,000	$3,896,000	$0	$0	$215,000	$215,000	$215,000
Waste Characterization Testing	$820,000	$790,000	($30,000)	$117,000	$61,000	($56,000)	($86,000)
Manifesting	$260,000	$243,000	($17,000)	$18,000	$14,000	($4,000)	($21,000)
Loading	$702,000	$702,000	$0	$3,000	$40,000	$37,000	$37,000
Waste Transportation	$819,000	$758,000	($61,000)	$144,000	$59,000	($85,000)	($146,000)

Table A-3. Co-Proposal Option: Summary of Pre- and Post-Rule Costs and Incremental Costs							
Cost Item	**1999 Plants**			**1997 Plants**			**Total Costs ($/yr)**
	Pre-Rule Costs ($/yr)	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	**Pre-Rule Costs ($/yr)**	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	
Recovery Transportation	$3,151,000	$3,002,000	($149,000)	$0	$94,000	$94,000	($55,000)
Salvage Revenue	($24,237,000)	($24,237,000)	$0	$0	($911,000)	($911,000)	($911,000)
Hazardous Materials Training	$258,000	$189,000	($69,000)	$69,000	$69,000	$0	($69,000)
Manifest Training	$57,000	$44,000	($13,000)	$13,000	$13,000	$0	($13,000)
BRS/General Administrative Duties	$69,000	$56,000	($13,000)	$18,000	$18,000	$0	($13,000)
One-Time Contingency Planning	$70,000	$50,000	($20,000)	$20,000	$20,000	$0	($20,000)
Initial Characterization	$216,000	$216,000	$0	$55,000	$55,000	$0	$0
One-Time Notification of Exclusion	$0	$20,000	$20,000	$0	$5,000	$5,000	$25,000
Off-site Recovery Subtotal	($11,495,000)	($11,914,000)	($419,000)	$776,000	($129,000)	($905,000)	($1,324,000)
Aggregate Cost Total	($318,478,000)	($329,859,000)	($12,266,000)	$18,377,000	$1,321,000	($17,056,000)	($28,437,000)

Table A-3. Co-Proposal Option: Summary of Pre- and Post-Rule Costs and Incremental Costs							
Cost Item	**1999 Plants**			**1997 Plants**			**Total Costs ($/yr)**
	Pre-Rule Costs ($/yr)	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	**Pre-Rule Costs ($/yr)**	**Post-Rule Costs ($/yr)**	**Incremental Costs ($/yr)**	

NOTES:

1.) Numbers in parentheses, "( )", represent negative costs that reflect revenues or cost savings.

2.) Incremental facility-level state tax costs for firms are estimated to be ($372,000) [$470,000 pre-rule and $98,000 post-rule] for 1999 on-site recovery facilities and ($166,000) [$191,000 pre-rule and $25,000 post-rule] for 1997 on-site recovery facilities. For off-site recovery facilities, they are ($2,000) [$9,000 pre-rule and $7,000 post-rule] for 1999 off-site recovery facilities and ($0) [$64 pre-rule and $42 post-rule] for 1997 off-site recovery facilities. Total facility-level state tax costs are ($540,000).

3.) Incremental generation state tax costs applied on a per ton basis for firms are estimated to be ($1,552,000) [$3,364,000 pre-rule and $1,812,000 post-rule] for 1999 on-site recovery facilities and ($29,000) [$393,000 pre-rule and $364,000 post-rule] for 1997 on-site recovery facilities. For off-site recovery facilities, they are ($0) [$174,000 pre-rule and $174,000 post-rule] for 1999 off-site recovery facilities and ($0) [$560 pre-rule and $536 post-rule] for 1997 off-site recovery facilities. Total per-ton generation state tax costs are ($1,581,000).

Appendix B

Review of Recycled Waste Quantities by Manufacturing Industries

One option considered in the ABR-related rulemaking was the limitation that only waste generated by manufacturing industries (NAICS 31-33) would be excluded as solid waste. This appendix presents a review of the generators of waste, in manufacturing and other industries, so that the impacts of this limitation can be more readily identified.

The following is a summary of findings relating to the waste currently being recycled within the same NAICS code from the 1999 BRS as well as the waste recycled within an industry in 1997, but not recycled in 1999. Given the amount of waste generated in 1997 and 1999, the manufacturing industry, defined by NAICS codes 31 through 33, represents the industry which would be most affected by the ruling. According to the data in Table 1, the manufacturing industry generated 97.5 percent of the total waste generated in 1999 and 88.4 percent of the total waste generated was in 1997.

Table B-1. Total Waste Generation for 1999 and 1997, including Waste Generated by the Manufacturing Industry 1/

Generation Year	Total Onsite and Offsite Managed Waste (tons)	Total Onsite and Offsite Managed Waste with NAICS Identified (tons)	Total Waste Generated by the Manufacturing Industry (tons)	Waste Generated by Manufacturers (%) 3/
1999	884,648	678,463	661,180	97.5
1997 2/	31,957	28,993	25,624	88.4
Total	916,605	707,456	686,804	97.1

1/ Waste quantities recycled (BRS management codes M011-M039) within the generating industry NAICS.
2/ Waste quantities recycled within an industry in 1997 but not in 1999.
3/ Manufacturers defined by NAICS codes 31 through 33.

Based on the 1999 and 1997 biennial report data, limiting the waste that would be excluded as solid waste would be a relatively minor limitation. Less than three percent of all waste generated would be affected by this limitation.

Appendix C

Limitation on Use of Reclaimed Product

One option considered in the ABR-related rulemaking is the limitation that any reclaimed material will have to be consumed by the same industry (or facility) that generated the waste. This appendix presents a preliminary review of the potential implications of this option, so that the impacts of this limitation can be more readily identified.

There are broad classes of materials being recovered through recycling that will be affected by any rule revising the definition of solid waste. Products recovered through recycling primarily consist of solvents, metals and acids. This discussion is limited to current on-site and off-site (within the same industry) recovery, and wastes recycled off-site in industries different from the generator which may be recovered on-site as a result of the rule.

It is not expected that waste currently being recycled will be affected by this potential limitation. Waste currently being recovered will likely continue to be recovered. It is expected that without the limitation additional waste will be recovered. The quantity of waste added as a result of the rule will be some component of the waste highlighted in Table 4-7, nearly 700,000 tons. If generators can only take advantage of the revised definition of solid waste if the recovered material is used by the generator, the amount of waste recovered will be less than the amount without the limitation. Unfortunately the total amount of waste which will be recovered with and without the limitation cannot be determined at this time.

Appendix D

MEMORANDUM

Date: February 4, 2003

To: Paul Borst, EPA/OSW/EMRAD
Tom Walker, IEc

From: Dave Gustafson and Shauna Lehmann, DPRA

Re: Recoverable Waste Type Analysis for the Economic Assessment of the Association of Battery Recyclers Proposed Rulemaking; EPA Contract No. 68-W-02-007, WA 1-05

This memorandum presents the results of DPRA's review of the waste stream types reported being recovered in the 1999 BRS. DPRA assumes that based on these recoverable waste types we can search the list of waste streams currently not recovered (i.e., land disposed or thermally destroyed) that may be recovered under post rule conditions. DPRA limited its initial review of waste streams to those SIC codes that reported recovering more than 30,000 tons either on site or off site in 1999. A more detailed summary of this review is presented in the two sections below. The following table presents a summary of DPRA's recommendations for each SIC reviewed. Based on the waste type commonalities identified from this review we may wish to expand the search for potentially recoverable wastes to include all SIC codes rather than limiting it to the SIC reviewed.

Summary of DPRA Recommendations		
SIC Code	**On-site Recovery**	**Off-Site Recovery**
3341 Secondary Smelting	Lead Battery Wastes (D008 waste code)	Lead Battery Wastes (D008 waste code)
2869 Organic Chemicals	Organic Liquids (B201 - B219 form codes, except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid).	Organic Liquids (B201 - B219 form codes, except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid); and Spent Carbon (B404 form code)
2819 Inorganic Chemicals	No Recommendations.	Not Reviewed (< 30,000 tons).
2491 Wood Preserving	Chlorophenolic Liquid Wastes (F032 EPA waste code). Exclude any waste streams with solid or sludge waste form codes.	Not Reviewed (< 30,000 tons).

Summary of DPRA Recommendations		
SIC Code	**On-site Recovery**	**Off-Site Recovery**
2851 Paints & Allied Products	Organic Liquids (B201 - B219 form codes, except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid).	Not Reviewed (< 30,000 tons).
2834 Pharma-ceutical Preparations	Organic Liquids (B201 - B219 form codes, except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid).	Not Reviewed (< 30,000 tons)
3312 Steel Works	Spent pickle liquor wastes (K062 waste code). Note that only one waste stream is reported recovered on site. Approximately five waste streams are shipped off site for recovery. DPRA tentatively recommends pulling non-recovered waste streams with EPA waste code K062 for evaluation as potentially recoverable waste streams post rule. If neutralization is the common management practice it may not be cost effective to recover this waste.	Emission control dust (K061 waste code).
3672 Printed Circuit Boards	Not Reviewed (< 30,000 tons).	a.) Metal-containing liquid wastes (B103, B106, or B107 form codes); b.) Lead solder dross waste (D008 waste code with form codes B304, B307, and B319); c.) electroplating wastewater treatment sludges (F006 waste code); d.) Solutions containing gold (F007 waste code); or e.) Solutions containing silver (D011 waste code).
2911 Petroleum Refining	Not Reviewed (< 30,000 tons).	Oily Sludges (B603 form code; may already be exempt if recovered); Spent Carbon (B404 form code); and Spent Catalysts (K171 and K172 waste codes)
3691 Storage Batteries	Not Reviewed (< 30,000 tons).	Lead Battery Wastes (D008 waste code)

Summary of DPRA Recommendations		
SIC Code	**On-site Recovery**	**Off-Site Recovery**
2821 Plastic Materials & Resins	Not Reviewed (< 30,000 tons).	Organic Liquids (B201 - B219 form codes, except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid).

On-Site Recovery: SIC codes recovering greater than 30,000 tons on site

SIC Code 3341: Secondary Smelting and Refining of Nonferrous Metals

98% of the managed quantity has a system type of M011-M019 (metals recovery). Four waste streams contribute to approximately 88% of the quantity for this system type and are as follows:

- Filter Press Cake from Wastewater Treatment System
  - EPA Code: D008 - Lead
  - Form Code: B319 - Other Waste Inorganic Solids
  - Quantity Managed: 42,972 tons
- Battery Components from Lead Acid Storage Batteries
  - EPA Code: D008 - Lead
  - Form Code: B309 - Batteries or battery parts, casings, cores
  - Quantity Managed: 26,347 tons
- Lead Groups from Battery Breaking/Desulfurization Operation
  - EPA Code: D008 - Lead
  - Form Code: B309 - Batteries or battery parts, casings, cores
  - Quantity Managed: 21,851 tons
- Slag Furnace By-Product Solid Originating from Recycling Operations
  - EPA Code: D008 - Lead
  - Form Code: B304 - Other dry ash, slag, or thermal residue
  - Quantity Managed: 10,645 tons

Of the 32 waste streams with metals being recovered on site 22 (69%) are reported containing lead (D008 EPA waste code). **Recommend pulling non-recovered waste streams within SIC 3341 that potentially contain recoverable amounts of lead (EPA waste code D008) post rule.**

SIC Code 2869: Industrial Organic Chemicals, nec

75% of the managed quantity has a system type of M031-M039 (other recovery). Three waste streams contribute to approximately 61% of the quantity for this system type and are as follows:

- Acidic Process Water
  - EPA Code: D002 - Corrosive Waste
  - Form Code: B105 - Acidic Aqueous Waste
  - Quantity Managed: 43,542 tons
- EDC Heavy Ends from Ethylene Dichloride Manufacturing
  - EPA Codes:
    D028 - 1,2-Dichloroethane

D034 - Hexachloroethane
D039 - Tetrachloroethylene
K019 - Heavy Ends from the Distillation of Ethylene Dichloride in Ethylene Dichloride Production
- Form Code: B219 - Other Organic Liquids
- Quantity Managed: 13,623 tons

- Acid By-Product from Production
  - EPA Code: D002 - Corrosive Waste
  - Form Code: B105 - Acidic Aqueous Waste
  - Quantity Managed: 10,610 tons

Even though two of the three largest waste streams are wastewater most waste streams have organic liquid waste form codes (B201 - B219). For waste streams being recovered by other methods on site 13 out of 18 (72%) have an organic liquid form code. For waste steams being recovered for solvents on site 12 of 15 (80%) have an organic liquid form code. **Recommend pulling non-recovered waste streams within SIC 2869 that are organic liquid form codes as potentially recoverable post rule. Include all waste streams with B200 form codes except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid) which are unlikely to be recoverable.**

SIC Code 2819: Industrial Inorganic Chemicals, nec

Virtually 100% of the managed quantity has a system type of M011-M019 (metals recovery). One waste stream contributes to approximately 96% of the quantity for this system type and is as follows:

- Rinse Waters, Process Wash Waters, and Rain Water
  - EPA Codes:
    D002 - Corrosive Waste
    D008 - Lead
  - Form Code: B106 - Caustic Solution with Metals but no Cyanides
  - Quantity Managed: 68,462 tons

No clear search pattern could be determined to identify potential waste streams that may be recovered post rule. **DPRA recommends conducting no additional searches for this SIC code.**

SIC Code 2491: Wood Preserving

100% of the managed quantity has a system type of M031-M039 (other recovery). One waste stream contributes to approximately 96% of the quantity for this system type and is as follows:

- Wastewater From Wood Preserving Process, Containing Creosote
  - EPA Codes:
    F032 - Wastewaters, Process Residuals, Preservative Drippage, and Spent Formulations from Wood Preserving Processes Generated at Plants that Currently Use, or Have Previously Used Chlorophenolic Formulations
    F034 - Wastewaters, Process Residuals, Preservative Drippage, and Spent Formulations from Wood Preserving Processes Generated at Plants that Use Creosote Formulations
  - Form Code: B102 - Aqueous Waste with Low Other Toxic Organics
  - Quantity Managed: 31,067 tons

Two of the three waste streams are reported under the F032 EPA waste code. **Recommend pulling non-recovered waste streams within SIC 2491 that contain the F032 EPA waste code. Exclude any waste streams with solid or sludge waste forms.**

SIC Code 2851: Paints and Allied Products

71% of the managed quantity has a system type of M021-M029 (solvents recovery). Two waste streams contribute to approximately 46% of the quantity for this system type and are as follows:

- Spent Solvent
  - EPA Codes:
    - D001 - Ignitable Waste
    - D005 - Barium
    - D007 - Chromium
    - D008 - Lead
    - D035 - Methyl ethyl ketone
    - F003 - Select List of Spent Non-Halogenated Solvents (see list)
    - F005 - Select List of Spent Non-Halogenated Solvents (see list)
  - Form Code: B201 - Concentrated Solvent-Water Solution
  - Quantity Managed: 9,792 tons
- Spent Organic Non-Halogenated Solvents
  - EPA Codes: (same as above)
  - Form Code: B203 - Nonhalogenated Solvent
  - Quantity Managed: 4,892 tons

Most waste streams have organic liquid waste form codes (B201 - B219). For waste streams being recovered for solvents on site 48 out of 53 (91%) have an organic liquid form code. Most waste streams contain F003 or F005 EPA waste codes. **Recommend pulling non-recovered waste streams within SIC 2851 that are organic liquid form codes as potentially recoverable post rule. Include all waste streams with B200 form codes except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid) which are unlikely to be recoverable.**

SIC Code 2834: Pharmaceutical Preparations

100% of the managed quantity has a system type of M021-M029 (solvents recovery). Four waste streams contribute to approximately 95% of the quantity for this system type and are as follows:

- (No Waste Description Listed)
  - EPA Code: D001 - Ignitable Waste
  - Form Code: B203 - Nonhalogenated Solvent
  - Quantity Managed: 10,548 tons
- Ignitable Spent Solvent from Pharmaceutical Manufacturing Process
  - EPA Codes:
    - D001 - Ignitable Waste
    - F003 - Select List of Spent Non-Halogenated Solvents (see list)
  - Form Code: B201 - Concentrated Solvent-Water Solution
  - Quantity Managed: 8,061 tons
- (No Waste Description Listed)
  - EPA Code: D001 - Ignitable Waste
  - Form Code: B203 - Nonhalogenated Solvent
  - Quantity Managed: 5,742 tons
- Ignitable Spent Solvent from Pharmaceutical Manufacturing Process

- EPA Codes:
  - D001 - Ignitable Waste
  - D038 - Pyridine
  - F005 - Select List of Spent Non-Halogenated Solvents (see list)
- Form Code: B201 - Concentrated Solvent-Water Solution
- Quantity Managed: 8,061 tons

Most waste streams have organic liquid waste form codes (B201 - B219). For waste streams being recovered by other methods on site 13 out of 18 (72%) have an organic liquid form code. All 12 waste steams being recovered for solvents have an organic liquid form code. **Recommend pulling non-recovered waste streams within SIC 2851 that are organic liquid form codes as potentially recoverable post rule. Include all waste streams with B200 form codes except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid) which are unlikely to be recoverable.**

SIC Code 3312: Steel Works, Blast Furnaces, and Rolling Mills

100% of the managed quantity has a system type of M031-M039 (other recovery). One waste stream contributes 100% of the quantity for this system type and is as follows:

- Spent Pickle Liquor HCl from Steel Processing
  - EPA Codes:
    - D002 - Corrosive Waste
    - K062 - Spent Pickle Liquor from Steel Finishing Operations of Plants that Produce Iron or Steel
  - Form Code: B103 - Spent Acid with Metals
  - Quantity Managed: 30,222 tons

Recommend pulling non-recovered waste streams within SIC 3312 that contain the EPA waste code K062. Note that only one waste stream is reported recovered on site. Approximately five waste streams are shipped off site for recovery. DPRA tentatively recommends pulling non-recovered waste streams with EPA waste code K062 for evaluation as potentially recoverable waste streams post rule. If neutralization is the common management practice it may not be cost effective to recover this waste.

<u>Off-Site Recovery: SIC codes recovering greater than 30,000 tons off site</u>

SIC Code 3312: Steel Works, Blast Furnaces, and Rolling Mills

96% of the shipped quantity has a system type of M011-M019 (metals recovery). The fifteen highest-quantity waste streams contribute to approximately 53% of the total quantity for this system type, and can be summarized by the following:

- Emission Control Dust from the Production of Steel in an Electric Arc Furnace
  - EPA Codes:
    - D006 - Cadmium
    - D008 - Lead
    - K061 - Emission Control Dust/Sludge from the Primary Production of Steel in Electric Furnaces
  - Form Codes:
    - B303 - Ash, slag, or other residue from incineration of wastes
    - B304 - Other dry ash, slag, or thermal residue
    - B306 - Dry lime or metal hydroxide solids not fixed
    - B319 - Other waste inorganic solids

B511 - Air pollution control device sludge

- Sum of Shipped Quantities: 251,441 tons

Most waste streams recovered off site contain the EPA waste code K061. 87 of the 143 (61%) of the waste streams contain the K061 waste code. **Recommend pulling non-recovered waste streams within SIC 3312 that contain the K061 EPA waste code.**

SIC Code 3672: Printed Circuit Boards

90% of the shipped quantity has a system type of M011-M019 (metals recovery).
NOTE: there are not many high-quantity waste streams for this system type, so it is difficult to determine the major contributing waste streams.

Most waste streams either contain either: a.) form codes B103, B106, or B107; b.) D008 waste code used for solder dross waste with form codes B304, B307, and B319; c.) F006; d.) F007 (gold solutions); or e.) D011 (silver solutions). **Recommend pulling non-recovered waste streams within SIC 3672 that contain one or more of the above codes.**

SIC Code 2911: Petroleum Refining

78% of the shipped quantity has a system type of M031-M039 (other recovery).
NOTE: there are not many high-quantity waste streams for this system type, so it is difficult to determine the major contributing waste streams.

Waste streams recovered off site by other recovery methods are identified as either oily sludge (form code B603) or spent carbon (form code B404). *Note, recovery of oily sludge (form code B603) may already be exempt under prior RCRA regulations. Records were removed in the November, 2002, Economic Assessment if the system type code was M032 (which includes waste oil recovery). The records remaining on the list have different system type codes (e.g., M039, other recovery - type unknown). We may wish to remove these records from the analysis given their oily sludge form code (B603).* In addition catalysts are being recovered (EPA waste codes K171 and K172). **Recommend pulling non-recovered waste streams within SIC 2911 that are oily sludges (form code B603) or spent carbon form code B404) as potentially recoverable post rule. In addition pull non-recovered waste streams containing EPA waste codes K171 and K172.**

SIC Code 2869: Industrial Organic Chemicals, nec

62% of the shipped quantity has a system type of M021-M029 (solvents recovery).
NOTE: there are not many high-quantity waste streams for this system type, so it is difficult to determine the major contributing waste streams.

Most waste streams have organic liquid waste form codes (B201 - B219). **Recommend pulling non-recovered waste streams within SIC 2869 that are organic liquid form codes as potentially recoverable post rule. Include all waste streams with B200 form codes except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid) which are unlikely to be recoverable. In addition pull all non-recovered waste streams that are spent carbon (form code B404).**

SIC Code 3341: Secondary Smelting and Refining of Nonferrous Metals

53% of the shipped quantity has a system type of M031-M039 (other recovery). Three waste streams contribute to approximately 98% of the quantity for this system type and can be summarized by the following:

- Plastic from Lead Acid Battery Cases Recovered from Battery Breaking Operations
    - EPA Code: D008 - Lead
    - Form Code: B309 - Batteries or battery parts, casings, cores
    - Sum of Shipped Quantities: 18,251 tons

Of the 53 waste streams with metals being recovered off site 27 (51%) are reported containing lead (D008 EPA waste code) primarily from batteries. **Recommend pulling non-recovered waste streams within SIC 3341 that potentially contain recoverable amounts of lead (EPA waste code D008) post rule.**

SIC Code 3691: Storage Batteries

99% of the shipped quantity has a system type of M011-M019 (metals recovery).
NOTE: there are not many high-quantity waste streams for this system type, so it is difficult to determine the major contributing waste streams.

Of the 142 waste streams with metals being recovered off site 116 (82%) are reported containing lead (D008 EPA waste code) primarily from batteries. **Recommend pulling non-recovered waste streams within SIC 3691 that potentially contain recoverable amounts of lead (EPA waste code D008) post rule.**

SIC Code 2821: Plastic Materials and Resins

82% of the shipped quantity has a system type of M021-M029 (solvents recovery).
NOTE: there are not many high-quantity waste streams for this system type, so it is difficult to determine the major contributing waste streams.

Most waste streams have organic liquid waste form codes (B201 - B219). **Recommend pulling non-recovered waste streams within SIC 2821 that are organic liquid form codes as potentially recoverable post rule. Include all waste streams with B200 form codes except B205 (oil-water emulsion or mixture), B206 (waste oil), B207 (concentrated aqueous solution of other organics), B210 (adhesives or epoxies), and B212 (reactive or polymerizable organic liquid) which are unlikely to be recoverable.**

Appendix E

MEMORANDUM

Date: November 14, 2002
To: Paul Borst, EPA/OSW/EMRAD, Tom Walker, IEc
From: Dave Gustafson, and Craig Simons, DPRA
Re: Analysis of Market Changes between 1997 and 1999

This memo presents a differential cost analysis between Subtitle C metals recovery and Subtitle C landfill for generators, comparing cost experiences in 1997 versus 1999. Also presented is an overview of the potential market affects regarding decisions to recycle solvent based waste versus sending the wastes to fuel blending.

Within the market things are changing. Currently we assume that since they recycled in the past they will do it in the future. Table 1 presents pricing charts for four key metals, as well as prices for landfilling, price indices for industrial chemicals, and petroleum. With landfill prices increasing,, metals prices decreasing, and solvent prices decreasing, at least between 1997 and 1999, the Agency needs to know what the overall affect is on generators' decision to recycle versus dispose of the wastes generated. The wastes considered are those wastes which may be affected by EPA exclusions, brought about by the ABR court decision. In short, we want to determine how to change the analytical framework for what wastes will be recycled. For example, should the Agency maintain the current assumption that 100 percent of 1997 metal and solvent recovery quantities will switch back to recycling or use some alternative assumption?

During the period from 1997 through 1999 key recyclable metals copper, chromium and nickel experienced price declines ranging from 15 to almost 30 percent, making them less attractive to recycle. However, at least partially offsetting the effect of the metal price declines, landfilling prices increased approximately 25 percent.

To identify how changes in costs may affect recycling versus landfilling decisions we look to the recycling of copper-bearing waste, the arrangements for which we know the most about. When this material is sent directly to the smelter, which only happens on a limited basis, the smelter would typically charge a processing fee, which has been reported to range from approximately $200 per ton[35] to $300 per ton.[36] For purposes of this assessment a processing charge of $300 per ton is assumed, with an additional charge of $50 per ton associated with increased transportation costs.[37] [38] Then, depending on the practice of the smelter, payment would be made to the generator based on the assay value of the copper, which may be approximately 90 percent of the total value.[39]

With this construct the breakeven point, above which the material may be attractive from a monetary standpoint, depends heavily on the copper content of the waste, the market price for copper, and the cost for landfilling. As

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[35] Sippel, 1999, Personal Communication, Noranda, Ontario, Canada.

[36] Jarvis, 1999, Personal Communication, Eritech, North Carolina

[37] Average distances to landfills and recyclers were previously estimated at 200 and 600 miles, respectively, based on a review of BRS data (DPRA, 1999. *Regulatory Impact Analysis of the Proposed Rule for F006 Wastewater Treatment Sludges*). The assumed incremental charge of $50 per ton is a proxy for this cost; actual costs would depend on load sizes, pickup arrangements and other factors.

[38] 1999 dollar basis, adjusted for 1997 calculations using GDP IPD

[39] Sippel, 1999, Personal Communication, Noranda, Ontario, Canada.

indicated in Table 1, the average price for copper, based on USGS data[40] was estimated to be $2,140 per ton in 1997 and $1,518 per ton in 1999. Subtitle C landfill disposal costs (with stabilization) are estimated at $241 and $304 per ton in 1997 and 1999, respectively.[41]

The breakeven point for copper-bearing sludge, below which the material would be more economical to landfill would be calculated as:

$$CC = (R - L) /(C * 0.9)$$

Where:

CC is the copper content of the waste considered for recycling, expressed as a decimal;
R is the per ton processing fee charged by the recycler ($300) plus incremental transportation costs, assumed to be $50, 1999 basis;
L is the landfill cost per ton (Subtitle C with stabilization);
C is the price of copper, and 0.9 is the portion of the assay value of the copper in the sludge which is assumed to be paid to the generator.

Given the assumptions presented previously, the breakeven copper content would be approximately 5.2 percent in 1997. In 1999 the breakeven copper content actually falls to 3.4 percent because the affect of the increased cost for landfilling outweighs the decreased price for copper. At least for copper waste, it appears that recycling was more attractive from a monetary standpoint in 1999.

Unfortunately we have not been able to make similar calculations for other metals, most notably nickel, chromium and lead due to a lack of information on recycling arrangements. However we note that the decline in copper prices was far greater, in percentage terms, than for the other metals. Based on this observation it would not seem that the changes in metals prices, when considered in concert with landfill prices, would adversely affect generators decisions regarding recycling their metal bearing wastes.

To examine the cost implications for nickel, chromium and lead generators we use the same general construct as for copper. That is, generators are assumed to pay a fee for recycling and in return are reimbursed for 90 percent of the assay value of the metal in the waste. This is for illustrative purposes only, to show the relative attractiveness of recycling in 1999 versus 1997.

The breakeven recycling charge for these metal bearing wastes, below which the material would be more economical to landfill would be calculated as:

$$R = L + (MC * (M * 0.9))$$

Where:

R is the per ton processing fee charged by the recycler plus incremental transportation costs;
L is the landfill cost per ton (Subtitle C with stabilization);
MC is the metal content of the waste considered for recycling, expressed as a decimal;
M is the price of the metal, and 0.9 is the portion of the assay value of the metal in the waste which is assumed to be paid to the generator.

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[40] USGS Mineral Commodity Summaries: Copper, January 2002

[41] Environmental Cost Handling Options and Solutions (ECHOS), Environmental Remediation Cost Data-Unit Price, 4th Annual Edition, published by R.S. Means and Delta Technologies Group, Inc., various years.

For purposes of illustration we consider wastes which have a three percent metal content. Given these assumptions, the results are presented in Table 2. What is notable is that for all of the metals the "breakeven" recycling fee in 1999 would have to be from 4 to 23 percent higher in 1999 versus 1997 for the generator to be more likely to dispose of the waste in a landfill. Stated differently, for nickel wastes, in 1997 the generator would be indifferent between recycling and disposal given a recycling fee of $411 per ton. In 1999 this breakpoint would actually increase to a fee of $451 per ton. Recycling fees are not at this level and consequently price variations cannot explain the switch in waste management from recycling in 1997 to disposal in 1999.

For solvent bearing wastes the decision to recycle or dispose depends on both the value of the solvents and their value to cement kilns as fuel. As shown in Table 2, industrial chemicals, as measured by the producer price index, declined in value by approximately 6 percent between 1997 and 1999. However residual fuel prices also declined by approximately 8 percent. Consequently the change in prices would not seem to affect generators' decisions to dispose through fuel blending.

In conclusion we recommend that the Agency continue to use the assumption that 100 percent of the 1997 waste streams which went to recycling (but did not in 1999) would again be sent to recycling as a result of the change in regulatory status for these wastes. We believe it is more likely that additional wastes (beyond these 1997 wastes) will be recycled because of any regulatory exclusions. In short, the above assumption serves as a conservative proxy.

Table 1. Overview of Prices for Major Recycled Metals, Industrial Chemicals and Land Disposal					
Commodity Price/Unit	**Year**				
	1996	**1997**	**1998**	**1999**	**2000**
Copper ($/ton)	2,180	2,140	1,572	1,518	1,764
Nickel ($/ton)	6,804	6,284	4,200	5,454	7,836
Chromium ($/ton)	9,500	10,400	9,460	8,860	8,860
Lead ($/ton)	976	930	906	874	872
Industrial Chemicals (PPI)	127	126	121	119	129
Subtitle C Landfill (w. stabilization) ($/ton)		241	241	304	318
Residual Fuel #6 ($/bl)	19	18	13	16	26
Recycling Fee ($/ton)		350	350	350	350
GDP IPD	0.956	0.974	0.986	1.000	1.023

Sources: Metals Prices form USGS; Industrial Chemicals PPI from Bureau of Econ Analysis; Landfill prices from R.S. Means.

Table 2. Analysis of Breakeven Points for Recycling, 1997 versus 1999		
	1997	**1999**
Copper recycling (% cu for breakeven)	5.2%	3.4%
Nickel recycling breakeven fee (3% Ni waste) ($/ton)	411	451
Chromium recycling breakeven fee (3% Cr waste) ($/ton)	522	543
Lead recycling breakeven fee (3% Pb waste) ($/ton)	266	328

Appendix F

State Hazardous Waste Generation Taxes and Fees

State imposed hazardous waste generation taxes and fees have been identified for facilities located in 27 states. These state taxes and fees are listed in Table F-1. Further analysis needs to be conducted for eight states identified in the Table F-1 to determine if "recovery" is included under their regulatory definition of "treatment."

Table F-1. State Hazardous Waste Generator Taxes and Fees											
State	**Non-size Specific Tax or Fee**	**Tax or Fee**	**Size-specific Taxes and Fees***								
			Description	**LQG >2,000 tons/yr**	**LQG 1,000 - 2,000 tons/yr**	**LQG 500 - 1,000 tons/yr**	**LQG 250 - 500 tons/yr**	**LQG 50 - 250 tons/yr**	**LQG 13.2 50 tons/yr**	**SQG 1.3 - 13.2 tons/yr**	**CESQG < 1.3 tons/yr**
AZ	Generators of waste that retain the waste on-site for disposal or who ship it off-site to a facility owned or operated by that generator	$4.00/ton									
AR			Monitoring/inspection fees	$500/yr	$500/yr	$500/yr	$500/yr	$500/yr	$500/yr	$150/yr	$0/yr
CA			Generator fee and generator waste reporting surcharge	$71,432/yr	$53,573/yr	$35,717/yr	$17,858/yr	$3,572/yr	$1,429/yr	$177/yr	$0/yr
CO	Hazardous waste TSDF annual operating fee (assumed off-site passed on to generator): Class III (resource recovery)	$2.50/ton									
CT	Hazardous waste generator tax	$9.59/ton									
DE	Fee for off-site treatment. Unclear if treatment equals recovery in this state? ($16/ton)	Further Analysis Needed									
GA			Hazardous waste management fee	$1/ton	$1/ton	$1/ton	$1/ton	$1/ton	$1/ton	$100/yr	$0/yr
ID	Hazardous waste fee	$30.00/ton									

Table F-1. State Hazardous Waste Generator Taxes and Fees											
State	**Non-size Specific Tax or Fee**	**Tax or Fee**	**Size-specific Taxes and Fees***								
			Description	**LQG >2,000 tons/yr**	**LQG 1,000 - 2,000 tons/yr**	**LQG 500 - 1,000 tons/yr**	**LQG 250 - 500 tons/yr**	**LQG 50 - 250 tons/yr**	**LQG 13.2 50 tons/yr**	**SQG 1.3 - 13.2 tons/yr**	**CESQG < 1.3 tons/yr**
IL	Fee for on- or off-site treatment. Unclear if treatment equals recovery in this state? ($7.19/ton)	Further Analysis Needed									
KS			Generator annual monitoring fee	$5,000/yr	$5,000/yr	$5,000/yr	$1,000/yr	$1,000/yr	$500/yr	$500/yr	$100/yr
KY	Generator hazardous waste assessment	$2.00/ton (on site) $4.00/ton (off site)									
ME	Off site “handling” fee (assume handling = recovery)	$30.00/ton									
MN			Quantity fee and tax and statewide program fee	$3,290/yr	$3,290/yr	$3,290/yr	$3,290/yr	$13.50/ton	$52.20/ton	$115.41/ ton	$274.72/ ton
MS			Pollution prevention fee for generators	$2,500/yr	$2,500/yr	$1,500/yr	$1,500/yr	$1,500/yr	$500/yr	$250/yr	$250/yr
MO	Hazardous waste fee. For category tax, unclear if treatment equals recovery in this state? [$0.7 (ton)^2 + $20/yr]	$1.00/ton									
MT	Generator fee. Did not have “Class” definition. Assumed middle class/fee.	$600.00/yr									

Table F-1. State Hazardous Waste Generator Taxes and Fees											
State	**Non-size Specific Tax or Fee**	**Tax or Fee**	**Size-specific Taxes and Fees***								
			Description	**LQG >2,000 tons/yr**	**LQG 1,000 - 2,000 tons/yr**	**LQG 500 - 1,000 tons/yr**	**LQG 250 - 500 tons/yr**	**LQG 50 - 250 tons/yr**	**LQG 13.2 50 tons/yr**	**SQG 1.3 - 13.2 tons/yr**	**CESQG < 1.3 tons/yr**
NE	TSDF fee assessment. Unclear if treatment equals recovery in this state? ($1.92/ton)	Further Analysis Needed									
NV	Fee for off-site treatment. Unclear if treatment equals recovery in this state? ($40.20/ton)	Further Analysis Needed									
NH			Hazardous waste fee	$60/ton	$60/ton	$60/ton	$60/ton	$60/ton	$60/ton	$60/ton	$0/ton
NJ	Manifest processing fee (assumed 18 tons shipped per manifest)	$0.50/ton	Hazardous waste generator biennial reporting fee and inspection and compliance review fee	$2,981/yr	$2,981/yr	$2,981/yr	$2,981/yr	$2,681/yr	$2,428/yr	$651/yr	$67/yr
NM			Generation fee and business fee	$20/ton $2,500/yr	$20/ton $2,500/yr	$20/ton $2,500/yr	$20/ton $2,500/yr	$20/ton $2,500/yr	$20/ton $2,500/yr	$250/yr $200/yr	$100/yr $0/yr
NY	Special assessment on off-site generation, treatment or disposal. Unclear if treatment equals recovery in this state? ($16/ton)	Further Analysis Needed	Hazardous waste program fees for generators	$40,000/yr	$40,000/yr	$20,000/yr	$6,000/yr	$6,000/yr	$1,000/yr	$0/yr	$0/yr
NC			Generator fee	$0.50/ton	$0.50/ton	$0.50/ton	$0.50/ton	$0.50/ton	$0.50/ton	$25/yr	$0/yr

Table F-1. State Hazardous Waste Generator Taxes and Fees											
State	**Non-size Specific Tax or Fee**	**Tax or Fee**	**Size-specific Taxes and Fees***								
			Description	**LQG >2,000 tons/yr**	**LQG 1,000 - 2,000 tons/yr**	**LQG 500 - 1,000 tons/yr**	**LQG 250 - 500 tons/yr**	**LQG 50 - 250 tons/yr**	**LQG 13.2 50 tons/yr**	**SQG 1.3 - 13.2 tons/yr**	**CESQG < 1.3 tons/yr**
OH	Hazardous waste treatment and disposal fee. Unclear if treatment equals recovery in this state? ($24/ton)	Further Analysis Needed									
OK	Annual fee for off-site recycling	$4.00/ton	Generator fee	$100/yr	$100/yr	$100/yr	$100/yr	$100/yr	$100/yr	$25/yr	$0/yr
OR	Annual hazardous waste generation fee	$45.00/ton	Annual activity verification fee	$525/yr	$525/yr	$525/yr	$525/yr	$525/yr	$525/yr	$300/yr	$0/yr
SC	Annual hazardous waste fee Annual nonhazardous waste fee	$34.00/ton $13.70/t									
TN			Annual generator fee	$900/yr	$900/yr	$900/yr	$900/yr	$900/yr	$900/yr	$550/yr	$0/yr
TX	Facility fee assessment. Unclear if treatment equals recovery in this state? ($4.80/ton)	Further Analysis Needed	Generation fee assessment	$2/ton $2/ton	$2/ton	$2/ton	$2/ton	$2/ton	$100/yr	$100/yr	$0/yr
VT	Hazardous waste generation fees	$28.00/ton									
WA	Hazardous waste education fee	$35.00/yr									
WV	Generator fee. Unclear if treatment equals recovery in this state?	Further Analysis Needed									

Table F-1. State Hazardous Waste Generator Taxes and Fees											
State	**Non-size Specific Tax or Fee**	**Tax or Fee**	**Size-specific Taxes and Fees***								
			Description	**LQG >2,000 tons/yr**	**LQG 1,000 - 2,000 tons/yr**	**LQG 500 - 1,000 tons/yr**	**LQG 250 - 500 tons/yr**	**LQG 50 - 250 tons/yr**	**LQG 13.2 50 tons/yr**	**SQG 1.3 - 13.2 tons/yr**	**CESQG < 1.3 tons/yr**
WI	Tonnage fee and manifest fee (assumed 18 tons shipped per manifest)	$0.26/ton									

References:

U.S. Army Corps of Engineers, *HTRW Center of Expertise Information - TDSF*, Section 8.2, obtained from http://www.environmental.usace.army.mil/library/pubs/tsdf/sec8-2/sec8-2.html on September 11, 2002.

Minnesota Pollution Control Agency, *Small and Large Quantity Generator License Fees and Generator (Superfund) Tax*, Waste/Hazardous Waste #1.03b, March 2002.

* These size categories do not fit for all states. For cost modeling purposes, taxes and fees for states with different size categories are approximate for certain size categories.

Appendix G Example Cost Calculation: 1999 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.32 fraction as residuals * 0.95 fraction characteristically hazardous) = 7.6 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered On Site	25 tons recovered waste/yr	Quantity of Waste Recovered On Site	25 tons recovered waste/yr
Estimated Residual Quantity	32% of recovered waste quantity will be residual (0.32) * (25 tons recovered waste/yr) = 8 tons residual/yr	Estimated Residual Quantity	32% of recovered waste quantity will be residual (0.32) * (25 tons recovered waste/yr) = 8 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (8 tons residual/yr) = 8 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	95% residual is characteristically hazardous; (0.95) * (8 tons residual/yr) = 7.6 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (8 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	5% residual is nonhazardous; (0.05) * (8 tons residual/yr) = 0.4 tons nonhazardous residual/yr

Appendix G Example Cost Calculation: 1999 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (25 tons recovered waste) = 5 tons recovered metal	Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (25 tons recovered waste) = 5 tons recovered metal
Number of Off-site Hazardous Waste Residual Shipments per Year	Given LQG then maximum of (4 shipments or 8 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.6 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year	(0.4 tons nonhazardous residual/18 tons per truck) = 0.02 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Landfill	338 miles	Distance to Nearest Off-site Hazardous Waste Landfill	338 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
On-site Metals Recovery Cost	($308/ton) * (25 tons recovered waste/yr) = $7,700/yr	On-site Metals Recovery Cost	($308/ton) * (25 tons recovered waste/yr) = $7,700/yr
Residual Off-site Hazardous Landfill Cost	maximum(($312/ton) * (8 tons hazardous residual per yr) or ($2,246/load) * (4 Hazardous Waste Shipments) = $8,984/yr	Residual Off-site Hazardous Landfill Cost	maximum (($312/ton) * (7.6 tons hazardous residual per yr) or (($2,246/load) * (1.33 Hazardous Waste Shipments) = $2,987/yr
Residual Off-site Non-hazardous Landfill Cost	($111/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Landfill Cost	($111/ton) * (0.4 tons non-hazardous residual per yr) = $44/yr

Appendix G Example Cost Calculation: 1999 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost	($1,410/load) * (1.33 Hazardous Loads + 0.02 Non-Hazardous Load) = $1,903/yr
Manifesting Costs	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs	($89/shipment) * (1.35 shipments/yr) = $120/yr
Loading Costs	($2.57/ton) * (8 tons residual) = $21/yr	Loading Costs	($2.57/ton) * (8 tons residual) = $21/yr
Residual Waste Transportation Costs	($3.73/mile)*(4 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $5,047/yr	Transportation Costs	($3.73/mile)*(1.33 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0.02 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $1,676/yr
Salvage (Recovered Product) Value	($4,770/ton metal) * (5 tons recovered metal/yr) = -$23,850/yr	Salvage (Recovered Product) Value	($4,770/ton metal) * (5 tons recovered metal/yr) = -$23,850/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639

Appendix G Example Cost Calculation: 1999 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(25 tons recovered waste/yr) = $1,125/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(7.6 tons residual/yr) = $342/yr
Total	$29,144/yr		$3,276/yr
Incremental Costs	-$25,868/yr		

Appendix H Example Cost Calculation: 1999 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.33 fraction as residuals * 0.85 fraction characteristically hazardous) = 7.0 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered On Site	25 tons recovered waste/yr	Quantity of Waste Recovered On Site	25 tons recovered waste/yr
Estimated Residual Quantity	33% of recovered waste quantity will be residual (0.33) * (25 tons recovered waste/yr) = 8.2 tons residual/yr	Estimated Residual Quantity	33% of recovered waste quantity will be residual (0.33) * (25 tons recovered waste/yr) = 8.2 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (8.2 tons residual/yr) = 8.2 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	85% residual is characteristically hazardous; (0.85) * (8.2 tons residual/yr) = 7.0 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (8.2 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	15% residual is nonhazardous; (0.15) * (8.2 tons residual/yr) = 1.2 tons nonhazardous residual/yr

Appendix H Example Cost Calculation: 1999 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (25 tons recovered waste) = 16.8 tons recovered solvent	Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (25 tons recovered waste) = 16.8 tons recovered solvent
Number of Off-site Hazardous Waste Residual Shipments per Year	Given LQG then maximum of (4 shipments or 8.2 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year	Given SQG and > 200 miles then maximum of (1.33 shipments or 7 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year	(1.2 tons nonhazardous residual/18 tons per truck) = 0.07 nonhazardous waste shipments per year
Distance to Nearest Off-site Energy Recovery Facility	577 miles	Distance to Nearest Off-site Energy Recovery Facility	577 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
On-site Solvent Recovery Cost	$43.49 * (25 tons recovered waste/yr) + $1,615 = $2,703/yr	On-site Solvent Recovery Cost	$43.49 * (25 tons recovered waste/yr) + $1,615 = $2,703/yr
Residual Off-site Energy Recovery Cost	maximum(($291/ton) * (8.2 tons hazardous residual per yr) or ($338/load) * (4 Hazardous Waste Shipments) = $2,386/yr	Residual Off-site Energy Recovery Cost	maximum (($291/ton) * (7 tons hazardous residual per yr) or (($338/load) * (1.33 Hazardous Waste Shipments) = $2,037/yr

Appendix H Example Cost Calculation: 1999 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Off-site Non-hazardous Energy Recovery Cost	($291/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-Hazardous Energy Recovery Cost	($291/ton) * (1.2 tons non-hazardous residual per yr) = $350/yr
Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost	($1,410/load) * (1.33 Hazardous Loads + 0.07 Non-Hazardous Load) = $1,974/yr
Manifesting Costs	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs	($89/shipment) * (1.40 shipments/yr) = $125/yr
Loading Costs	($2.57/ton) * (8.2 tons residual) = $21/yr	Loading Costs	($2.57/ton) * (8.2 tons residual) = $21/yr
Residual Waste Transportation Costs	($2.94/mile)*(4 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0 nonhazardous waste shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $6,786/yr	Residual Waste Transportation Costs	($2.94/mile)*(1.33 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0.07 nonhazardous waste shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $2,375/yr
Salvage (Recovered Product) Value	($1,543/ton solvent) * (16.8 tons recovered solvent/yr) = -$25,922/yr	Salvage (Recovered Product) Value	($1,543/ton solvent) * (16.8 tons recovered solvent/yr) = -$25,922/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160

Appendix H Example Cost Calculation: 1999 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr		Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(25 tons recovered waste/yr) = $1,125/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(7 tons residual/yr) = $315/yr
Total	$22,213/yr		$1,308/yr
Incremental Costs	-$20,905/yr		

Appendix I Example Cost Calculation: 1999 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	30 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(30 tons hazardous waste/yr) - (30 tons recovered waste/yr)+ (30 tons recovered waste/yr*0.26 fraction as residuals * 0.75 fraction characteristically hazardous) = 5.8 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered On Site	30 tons recovered waste/yr	Quantity of Waste Recovered On Site	30 tons recovered waste/yr
Estimated Residual Quantity	26% of recovered waste quantity will be residual (0.26) * (30 tons recovered waste/yr) = 7.8 tons residual/yr	Estimated Residual Quantity	26% of recovered waste quantity will be residual (0.26) * (30 tons recovered waste/yr) = 7.8 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (7.8 tons residual/yr) = 7.8 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	75% residual is characteristically hazardous; (0.75) * (7.8 tons residual/yr) = 5.9 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (7.8 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	25% residual is nonhazardous; (0.25) * (7.8 tons residual/yr) = 2.0 tons nonhazardous residual/yr

Appendix I Example Cost Calculation: 1999 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered metals product (0.74) * (30 tons recovered waste) = 22.2 tons recovered acid	Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered metals product (0.74) * (30 tons recovered waste) = 22.2 tons recovered acid
Number of Off-site Hazardous Waste Residual Shipments per Year	Given LQG then maximum of (4 shipments or 7.8 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.8 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year	(2.0 tons nonhazardous residual/18 tons per truck) = 0.11 nonhazardous waste shipments per year
Distance to Nearest Off-site Acid Neutralization, Stabilization, Landfill Facility	405 miles	Distance to Nearest Off-site Acid Neutralization, Stabilization, Landfill Facility	405 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
On-site Acid Recovery Cost	$79.50 * (30 tons recovered waste/yr) + $1,804 = $4,189/yr	On-site Acid Recovery Cost	$79.50 * (30 tons recovered waste/yr) + $1,804 = $4,189/yr
Residual Off-site Acid Neutralization, Stabilization, Landfill Facility Cost	maximum(($38/ton) * (7.8 tons hazardous residual per yr) or ($316/load) * (4 Hazardous Waste Shipments) = $1,264/yr	Residual Off-site Acid Neutralization, Stabilization, Landfill Facility Cost	maximum (($38/ton) * (5.9 tons hazardous residual per yr) or (($316/load) * (1.33 Hazardous Waste Shipments) = $1,264/yr

Appendix I Example Cost Calculation: 1999 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Off-site Non-hazardous Acid Neutralization, Stabilization, Landfill Facility Cost	($38/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Acid Neutralization, Stabilization, Landfill Facility Cost	($38/ton) * (2.0 tons non-hazardous residual per yr) = $76/yr
Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost	($1,410/load) * (1.33 Hazardous Loads + 0.11 Non-Hazardous Load) = $2,045/yr
Manifesting Costs	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs	($89/shipment) * (1.44 shipments/yr) = $128/yr
Loading Costs	($2.57/ton) * (7.8 tons residual) = $20/yr	Loading Costs	($2.57/ton) * (7.8 tons residual) = $20/yr
Residual Waste Transportation Costs	($3.50/mile)*(4 hazardous waste landfill shipments/yr)*(405 miles to hazardous acid neutralization, stabilization, landfill/hazardous waste shipment) + ($3.50/mile)*(0 nonhazardous waste landfill shipments/yr)*(405 miles to nonhazardous acid neutralization, stabilization landfill/nonhazardous waste shipment) = $5,670/yr	Transportation Costs	($3.50/mile)*(1.33 hazardous waste landfill shipments/yr)*(405 miles to hazardous acid neutralization, stabilization/hazardous waste shipment) + ($3.50/mile)*(0.11 nonhazardous waste landfill shipments/yr)*(405 miles to nonhazardous acid neutralization, stabilization/nonhazardous waste shipment) = $2,055/yr
Salvage (Recovered Product) Value	($298.12/ton acid) * (22.2 tons recovered acid/yr) = -$6,618/yr	Salvage (Recovered Product) Value	($298.12/ton acid) * (22.2 tons recovered acid/yr) = -$6,618/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr

Appendix I Example Cost Calculation: 1999 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(30 tons recovered waste/yr) = $1,575/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(5.9 tons residual/yr) = $266/yr
Total	$36,217/yr		$15,743/yr
Incremental Costs	-$20,474		

Appendix J Example Cost Calculation: 1997 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.32 fraction as residuals * 0.95 fraction characteristically hazardous) = 7.6 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered On Site	0 tons recovered waste/yr	Quantity of Waste Recovered On Site	25 tons recovered waste/yr
Estimated Hazardous Waste Quantity	100% of waste quantity will be disposed (1) * (25 tons recovered waste/yr) = 25 tons waste/yr	Estimated Residual Quantity	32% of recovered waste quantity will be residual (0.32) * (25 tons recovered waste/yr) = 8 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	95% residual is characteristically hazardous; (0.95) * (8 tons residual/yr) = 7.6 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	5% residual is nonhazardous; (0.05) * (8 tons residual/yr) = 0.4 tons nonhazardous residual/yr

Appendix J Example Cost Calculation: 1997 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (0 tons recovered waste) = 0 tons recovered metal	Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (25 tons recovered waste) = 5 tons recovered metal
Number of Off-site Hazardous Waste Shipments per Year	Given LQG then maximum of (4 shipments or 25 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Shipments per Year	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.6 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Shipments per Year	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-hazardous Waste Shipments per Year	(0.4 tons nonhazardous residual/18 tons per truck) = 0.02 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Landfill	338 miles	Distance to Nearest Off-site Hazardous Waste Landfill	338 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
On-site Metals Recovery Cost	($308/ton) * (0 tons recovered waste/yr) = $0/yr	On-site Metals Recovery Cost	($308/ton) * (25 tons recovered waste/yr) = $7,700/yr
Off-site Disposal Cost at Hazardous Landfill (baseline)	maximum(($312/ton) * (25 tons hazardous residual per yr) or ($2,246/load) * (4 Hazardous Waste Shipments) = $8,984/yr	Residual Off-site Hazardous Landfill Cost	maximum (($312/ton) * (7.6 tons hazardous residual per yr) or (($2,246/load) * (1.33 Hazardous Waste Shipments) = $2,987/yr
Residual Off-site Non-hazardous Landfill Cost	($111/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Landfill Cost	($111/ton) * (0.4 tons non-hazardous residual per yr) = $44/yr

Appendix J Example Cost Calculation: 1997 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost	($1,410/load) * (1.33 Hazardous Loads + 0.02 Non-Hazardous Load) = $1,903/yr
Manifesting Costs	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs	($89/shipment) * (1.35 shipments/yr) = $120/yr
Loading Costs	($2.57/ton) * (25 tons waste) = $64/yr	Loading Costs	($2.57/ton) * (8 tons residual) = $21/yr
Residual Waste Transportation Costs	($3.73/mile)*(4 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $5,047/yr	Residual Waste Transportation Costs	($3.73/mile)*(1.33 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0.02 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $1,668/yr
Salvage (Recovered Product) Value	($4,770/ton metal) * (0 tons recovered metal/yr) = -$0/yr	Salvage (Recovered Product) Value	($4,770/ton metal) * (5 tons recovered metal/yr) = -$23,850/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639

Appendix J Example Cost Calculation: 1997 On-site Metals Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(25 tons waste/yr) = $1,125/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(7.6 tons residual/yr) = $342/yr
Total	$45,337/yr		$3,268/yr
Incremental Costs	-$42,069/yr		

Appendix K Example Cost Calculation: 1997 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.33 fraction as residuals * 0.85 fraction characteristically hazardous) = 7 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered On Site	0 tons recovered waste/yr	Quantity of Waste Recovered On Site	25 tons recovered waste/yr
Estimated Hazardous Waste Quantity	100% of waste quantity will be disposed (1) * (25 tons recovered waste/yr) = 25 tons waste/yr	Estimated Residual Quantity	33% of recovered waste quantity will be residual (0.33) * (25 tons recovered waste/yr) = 8.2 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	85% residual is characteristically hazardous; (0.85) * (8.2 tons residual/yr) = 7.0 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	15% residual is nonhazardous; (0.15) * (8.2 tons residual/yr) = 1.2 tons nonhazardous residual/yr

Appendix K Example Cost Calculation: 1997 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (0 tons recovered waste) = 0 tons recovered solvent	Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (25 tons recovered waste) = 16.8 tons recovered solvent
Number of Off-site Hazardous Waste Shipments per Year	Given LQG then maximum of (4 shipments or 50 tons hazardous waste/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Shipments per Year	Given SQG and > 200 miles then maximum of (1.33 shipments or 7 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Shipments per Year	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year	(1.2 tons nonhazardous residual/18 tons per truck) = 0.07 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Energy Recovery Facility	577 miles	Distance to Nearest Off-site Hazardous Waste Energy Recovery Facility	577 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
On-site Solvent Recovery Cost	$43.49 * (0 tons recovered waste/yr) + $1,615 = $0/yr	On-site Solvent Recovery Cost	$43.49 * (25 tons recovered waste/yr) + $1,615 = $2,703/yr
Off-site Disposal Cost at Energy Recovery Facility/Cement Kiln (baseline)	($291/ton) * (25 tons hazardous residual per yr) = $7,275/yr	Residual Off-site Hazardous Energy Recovery Cost	maximum (($291/ton) * (7 tons hazardous residual per yr) or (($338/load) * (1.33 Hazardous Waste Shipments) = $2,037/yr

Appendix K Example Cost Calculation: 1997 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Off-site Non-hazardous Landfill Cost	($111/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Energy Recovery Cost	($291/ton) * (1.2 tons non-hazardous residual per yr) = $349/yr
Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost	($1,410/load) * (1.33 Hazardous Loads + 0.07 Non-Hazardous Load) = $1,974/yr
Manifesting Costs	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs	($89/shipment) * (1.40 shipments/yr) = $125/yr
Loading Costs	($2.57/ton) * (25 tons waste) = $64/yr	Loading Costs	($2.57/ton) * (8.2 tons residual) = $21/yr
Hazardous Waste Transportation Costs	($2.94/mile)*(4 hazardous waste energy recovery shipments/yr)*(577 miles to hazardous energy recovery facility/hazardous waste shipment) + ($2.94/mile)*(0 nonhazardous waste energy recovery shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $6,786/yr	Residual Waste Transportation Costs	($2.94/mile)*(1.33 hazardous waste energy recovery shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.97/mile)*(0.07 nonhazardous waste energy recovery shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $2,375/yr
Salvage (Recovered Product) Value	($1,543/ton solvent) * (0 tons recovered solvent/yr) = -$0/yr	Salvage (Recovered Product) Value	($1,543/ton solvent) * (16.8 tons recovered solvent/yr) = -$25,922/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0

Appendix K Example Cost Calculation: 1997 On-site Solvents Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(25 tons recovered waste/yr) = $1,125/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(7 tons residual/yr) = $315/yr
Total	$45,367/yr		-$3,690/yr
Incremental Costs	-$49,057/yr		

Appendix L Example Cost Calculation: 1997 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	30 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(30 tons hazardous waste/yr) - (30 tons recovered waste/yr)+ (30 tons recovered waste/yr*0.26 fraction as residuals * 0.75 fraction characteristically hazardous) = 5.8 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered On Site	0 tons recovered waste/yr	Quantity of Waste Recovered On Site	30 tons recovered waste/yr
Estimated Hazardous Waste Quantity	100% of waste quantity will be disposed (1) * (30 tons disposed waste/yr) = 30 tons waste/yr	Estimated Residual Quantity	26% of recovered waste quantity will be residual (0.26) * (30 tons recovered waste/yr) = 7.8 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	75% residual is characteristically hazardous; (0.75) * (7.8 tons residual/yr) = 5.8 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	25% residual is nonhazardous; (0.25) * (7.8 tons residual/yr) = 2 tons nonhazardous residual/yr

Appendix L Example Cost Calculation: 1997 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered acid product (0.74) * (0 tons recovered waste) = 0 tons recovered acid	Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered acid product (0.74) * (30 tons recovered waste) = 22 tons recovered acid
Number of Off-site Hazardous Waste Shipments per Year	Given LQG then maximum of (4 shipments or 30 tons hazardous waste/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.8 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Shipments per Year	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year	(2 tons nonhazardous residual/18 tons per truck) = 0.11 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Acid Neutralization, Stabilization, Landfill Facility	405 miles	Distance to Nearest Off-site Hazardous Waste Acid Neutralization, Stabilization, Landfill Facility	405 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
On-site Acid Recovery Cost	$79.50 * (0 tons recovered waste/yr) + $1,809 = $0/yr	On-site Acid Recovery Cost	$79.50 * (30 tons recovered waste/yr) + $1,809 = $4,194/yr
On-site Treatment Cost by Acid Neutralization (baseline)	($3.26/ton + $18,830) * (30 tons hazardous waste per yr) = $18,928/yr	Residual Off-site Hazardous Acid Neutralization, Stabilization, Landfill Cost	maximum (($38/ton) * (5.8 tons hazardous residual per yr) or (($316/load) * (1.33 Hazardous Waste Shipments) = $420/yr

Appendix L Example Cost Calculation: 1997 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Off-site Non-hazardous Acid Neutralization, Stabilization, Landfill Cost	($38/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Acid Neutralization, Stabilization, Landfill Cost	($38/ton) * (2 tons non-hazardous residual per yr) = $76/yr
Waste Characterization Testing Cost	($1,410/load) * (0 Hazardous Loads + 0 Non-Hazardous Load) = $0/yr	Waste Characterization Testing Cost	($1,410/load) * (1.33 Hazardous Loads + 0.11 Non-Hazardous Load) = $2,030/yr
Manifesting Costs	($236/shipment) * (0 shipments/yr) = $0/yr	Manifesting Costs	($89/shipment) * (1.44 shipments/yr) = $128/yr
Loading Costs	($2.57/ton) * (0 tons residual) = $0/yr	Loading Costs	($2.57/ton) * (7.8 tons residual) = $20/yr
Residual Waste Transportation Costs	($3.50/mile)*(0 hazardous waste shipments/yr)*(405 miles to hazardous acid neutralization, stabilization, landfill/hazardous waste shipment) + ($3.50/mile)*(0 nonhazardous waste shipments/yr)*(405 miles to nonhazardous acid neutralization, stabilization, landfill/nonhazardous waste shipment) = $0/yr	Residual Waste Transportation Costs	($3.50/mile)*(1.33 hazardous waste shipments/yr)*(405 miles to hazardous acid neutralization, stabilization, landfill/hazardous waste shipment) + ($3.50/mile)*(0.11 nonhazardous waste shipments/yr)*(405 miles to nonhazardous acid neutralization, stabilization, landfill/nonhazardous waste shipment) = $2,055/yr
Salvage (Recovered Product) Value	($298.12/ton acid) * (0 tons recovered acid/yr) = -$0/yr	Salvage (Recovered Product) Value	($298.12/ton acid) * (22 tons recovered acid/yr) = -$6,559/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $0/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr

Appendix L Example Cost Calculation: 1997 On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(30 tons neutralized waste/yr) = $1,350/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(5.8 tons residual waste/yr) = $261/yr
Total	$41,983/yr		$14,958/yr
Incremental Costs	-$27,025/yr		

Appendix M Example Cost Calculation: 1999 Off-site Metals Recovery Within Same NAICS (2001$)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.32 fraction as residuals * 0.95 fraction characteristically hazardous) = 7.6 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered Off Site	25 tons recovered waste/yr	Quantity of Waste Recovered Off Site	25 tons/yr
Estimated Residual Quantity for Recovery Facility*	32% of recovered waste quantity will be residual (0.32) * (25 tons recovered waste/yr) = 8 tons residual/yr	Estimated Residual Quantity for Recovery Facility*	32% of recovered waste quantity will be residual (0.32) * (25 tons recovered waste/yr) = 8 tons residual/yr
Estimated Hazardous Residual Quantity for Recovery Facility*	100% residual is listed & characteristically hazardous; (1.00) * (8 tons residual/yr) = 8 tons hazardous residual/yr	Estimated Hazardous Residual Quantity for Recovery Facility*	95% residual is characteristically hazardous; (0.95) * (8 tons residual/yr) = 7.6 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity for Recovery Facility*	0% residual is nonhazardous; (0) * (8 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity for Recovery Facility*	5% residual is nonhazardous; (0.05) * (8 tons residual/yr) = 0.4 tons nonhazardous residual/yr

Appendix M Example Cost Calculation: 1999 Off-site Metals Recovery Within Same NAICS (2001$)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (25 tons recovered waste) = 5 tons recovered metal	Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (25 tons recovered waste) = 5 tons recovered metal
Number of Off-site Metals Recovery Shipments per Year by Generator	25 tons recovered waste /18 tons per truck) = 1.4 recovery shipments per year	Number of Off-site Metals Recovery Shipments per Year by Generator	25 tons recovered waste /18 tons per truck) = 1.4 recovery shipments per year
Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given LQG then maximum of (4 shipments or 8 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.6 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year for Recovery Facility*	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year for Recovery Facility*	(0.4 tons nonhazardous residual/18 tons per truck) = 0.02 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Landfill	338 miles	Distance to Nearest Off-site Hazardous Waste Landfill	338 miles
Distance to Off-site Recovery Facility	521 miles	Distance to Off-site Recovery Facility	521 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
Off-site Metals Recovery Cost for Generator	($308/ton) * (25 tons recovered waste/yr) = $7,700/yr	Off-site Metals Recovery Cost for Generator	($308/ton) * (25 tons recovered waste/yr) = $7,700/yr

Appendix M Example Cost Calculation: 1999 Off-site Metals Recovery Within Same NAICS (2001$)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Off-site Hazardous Landfill Cost for Recovery Facility*	maximum(($312/ton) * (8 tons hazardous residual per yr) or ($2,246/load) * (4 Hazardous Waste Shipments) = $8,984/yr	Residual Off-site Hazardous Landfill Cost for Recovery Facility*	maximum (($312/ton) * (7.6 tons hazardous residual per yr) or (($2,246/load) * (1.33 Hazardous Waste Shipments) = $2,987/yr
Residual Off-site Non-hazardous Landfill Cost for Recovery Facility*	($111/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Landfill Cost for Recovery Facility*	($111/ton) * (0.4 tons non-hazardous residual per yr) = $44/yr
Waste Characterization Testing Cost for Recovery Facility*	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost for Recovery Facility*	($1,410/load) * (1.33 Hazardous Loads + 0.02 Non-Hazardous Load) = $1,903/yr
Manifesting Costs for Generator and Recovery Facility	($236/shipment) * (1.4 Recovery shipments/yr + 4 Hazardous residual shipments) = $1,274/yr	Manifesting Costs for Generator and Recovery Facility	($89/shipment) * (1.33 residual shipments/yr + 1.4 recovery shipments/yr) = $243/yr
Loading Costs for Generator and Recovery Facility	($2.57/ton) * (8 tons residual + 25 tons recovered waste) = $85/yr	Loading Costs for Generator and Recovery Facility	($2.57/ton) * (8 tons residual + 25 tons recovered waste) = $85/yr
Residual Waste Transportation Costs for Recovery Facility*	($3.73/mile)*(4 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $5,047/yr	Residual Transportation Costs for Recovery Facility*	($3.73/mile)*(1.33 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0.02 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $1,668/yr
Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.4 recovered waste shipments/yr)*(521 miles to recovery facility/hazardous waste shipment) = $4,522/yr	Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.4 recovered waste shipments/yr)*(521 miles to recovery facility/hazardous waste shipment) = $4,522/yr

Appendix M Example Cost Calculation: 1999 Off-site Metals Recovery Within Same NAICS (2001$)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Salvage (Recovered Product) Value	($4,770/ton metal) * (5 tons recovered metal/yr) = -$23,850/yr	Salvage (Recovered Product) Value	($4,770/ton metal) * (5 tons recovered metal/yr) = -$23,850/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee for Generator	Given Oregon then: ($45 generation fee/ton)*(25 tons recovered waste/yr) = $1,125/yr	State Generation Tax/Fee for Recovery Facility*	Given Oregon then: ($45 generation fee/ton)*(7.6 tons recovered waste/yr) = $342/yr
Total	$34,060/yr		$25,077/yr
Incremental Costs	-$8,983/yr		

* Given wastes are transferred within the same NAICS, it is assumed that the recovery facility in most cases is owned by the same company that owns the generator facility. Costs for the recovery facility are added to the generator's costs because the same company carrying the burden of the added cost.

Appendix N Example Cost Calculation: 1999 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.33 fraction as residuals * 0.85 fraction characteristically hazardous) = 7 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered Off Site	25 tons recovered waste/yr	Quantity of Waste Recovered Off Site	25 tons recovered waste /yr
Estimated Residual Quantity for Recovery Facility*	33% of recovered waste quantity will be residual (0.33) * (25 tons recovered waste/yr) = 8.2 tons residual/yr	Estimated Residual Quantity for Recovery Facility *	33% of recovered waste quantity will be residual (0.33) * (25 tons recovered waste/yr) = 8.2 tons residual/yr
Estimated Hazardous Residual Quantity for Recovery Facility*	100% residual is listed & characteristically hazardous; (1.00) * (8.2 tons residual/yr) = 8.2 tons hazardous residual/yr	Estimated Hazardous Residual Quantity for Recovery Facility*	85% residual is characteristically hazardous; (0.85) * (8.2 tons residual/yr) = 7 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity for Recovery Facility*	0% residual is nonhazardous; (0) * (8.2 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity for Recovery Facility*	15% residual is nonhazardous; (0.15) * (8.2 tons residual/yr) = 1.2 tons nonhazardous residual/yr

Appendix N Example Cost Calculation: 1999 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (25 tons recovered waste) = 16.8 tons recovered solvent	Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (25 tons recovered waste) = 16.8 tons recovered solvent
Number of Off-site Solvent Recovery Shipments per Year	25 tons recovered waste /18 tons per truck) = 1.4 recovery shipments per year	Number of Off-site Solvent Recovery Shipments per Year	25 tons recovered waste /18 tons per truck) = 1.4 recovery shipments per year
Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given LQG then maximum of (4 shipments or 8.2 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given SQG and > 200 miles then maximum of (1.33 shipments or 7 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year for Recovery Facility*	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year for Recovery Facility*	(1.2 tons nonhazardous residual/18 tons per truck) = 0.07 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Energy Recovery	577 miles	Distance to Nearest Off-site Hazardous Waste Energy Recovery Facility	577 miles
Distance to Off-site Recovery Facility	521 miles	Distance to Off-site Recovery Facility	521 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
Off-site Solvent Recovery Cost	($1,066/ton) * (25 tons recovered waste/yr) = $26,650/yr	Off-site Solvent Recovery Cost	($1,066/ton) * (25 tons recovered waste/yr) = $26,650/yr

Appendix N Example Cost Calculation: 1999 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Off-site Hazardous Energy Recovery Cost for Recovery Facility*	maximum(($291/ton) * (8.2 tons hazardous residual per yr) or ($338/load) * (4 Hazardous Waste Shipments) = $2,386/yr	Residual Off-site Hazardous Energy Recovery Cost for Recovery Facility*	maximum (($291/ton) * (7 tons hazardous residual per yr) or (($338/load) * (1.33 Hazardous Waste Shipments) = $2,037/yr
Residual Off-site Non-Hazardous Energy Recovery Cost	($291/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-Hazardous Energy Recovery Cost	($291/ton) * (1.2 tons non-hazardous residual per yr) = $349/yr
Waste Characterization Testing Cost for Recovery Facility*	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost for Recovery Facility*	($1,410/load) * (1.33 Hazardous Loads + 0.07 Non-Hazardous Load) = $1,974/yr
Manifesting Costs for Generator & Recovery Facility*	($236/shipment) * (1.4 Recovery shipments/yr + 4 Hazardous residual shipments) = $1,274/yr	Manifesting Costs for Generator & Recovery Facility*	($89/shipment) * (1.33 residual shipments/yr + 1.4 recovery shipments/yr) = $243/yr
Loading Costs for Generator & Recovery Facility*	($2.57/ton) * (8.2 tons residual + 25 tons recovered waste) = $85/yr	Loading Costs for Generator & Recovery Facility*	($2.57/ton) * (8.2 tons residual + 25 tons recovered waste) = $85/yr
Residual Waste Transportation Costs for Recovery Facility*	($2.94/mile)*(4 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0 nonhazardous waste energy recovery shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $6,786/yr	Residual Waste Transportation Costs for Recovery Facility*	($2.94/mile)*(1.33 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0.07 nonhazardous waste shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $2,375/yr
Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.4 recovered waste shipments/yr)*(521 miles to recovery facility/hazardous waste shipment) = $4,522/yr	Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.4 recovered waste shipments/yr)*(521 miles to hazardous recovery facility/hazardous waste shipment) = $4,522/yr

Appendix N Example Cost Calculation: 1999 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Salvage (Recovered Product) Value	($1,543/ton solvent) * (16.8 tons recovered solvent/yr) = -$25,922/yr	Salvage (Recovered Product) Value	($1,543/ton solvent) * (16.8 tons recovered solvent/yr) = -$25,922/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee for Generator	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee for Recovery Facility*	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee for Generator	Given Oregon then: ($45 generation fee/ton)*(25 tons recovered waste/yr) = $1,125/yr	State Generation Tax/Fee for Recovery Facility*	Given Oregon then: ($45 generation fee/ton)*(7 tons recovered waste/yr) = $315/yr
Total	$46,079/yr		-$24,961/yr
Incremental Costs	-$21,118/yr		

* Given wastes are transferred within the same NAICS, it is assumed that the recovery facility in most cases is owned by the same company that owns the generator facility. Costs for the recovery facility are added to the generator's costs because the same company carrying the burden of the added cost.

Appendix O Example Cost Calculation: 1999 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	30 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(30 tons hazardous waste/yr) - (30 tons recovered waste/yr)+ (30 tons recovered waste/yr*0.26 fraction as residuals * 0.75 fraction characteristically hazardous) = 5.8 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered Off Site	30 tons recovered waste/yr	Quantity of Waste Recovered Off Site	30 tons recovered waste/yr
Estimated Residual Quantity for Recovery Facility*	26% of recovered waste quantity will be residual (0.26) * (30 tons recovered waste/yr) = 7.8 tons residual/yr	Estimated Residual Quantity for Recovery Facility*	26% of recovered waste quantity will be residual (0.26) * (30 tons recovered waste/yr) = 7.8 tons residual/yr
Estimated Hazardous Residual Quantity for Recovery Facility*	100% residual is listed & characteristically hazardous; (1.00) * (7.8 tons residual/yr) = 7.8 tons hazardous residual/yr	Estimated Hazardous Residual Quantity for Recovery Facility*	75% residual is characteristically hazardous; (0.75) * (7.8 tons residual/yr) = 5.8 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity for Recovery Facility*	0% residual is nonhazardous; (0) * (7.8 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity for Recovery Facility*	25% residual is nonhazardous; (0.25) * (7.8 tons residual/yr) = 2 tons nonhazardous residual/yr

Appendix O Example Cost Calculation: 1999 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered metals product (0.74) * (30 tons recovered waste) = 21.2 tons recovered acid	Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered metals product (0.74) * (30 tons recovered waste) = 22.2 tons recovered acid
Number of Off-site Acid Recovery Shipments per Year	30 tons recovered waste/18 tons per truck = 1.7 recovery shipments per year	Number of Off-site Acid Recovery Shipments per Year	30 tons recovered waste/18 tons per truck = 1.7 recovery shipments per year
Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given LQG then maximum of (4 shipments or 7.8 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.8 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year for Recovery Facility*	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year for Recovery Facility*	(2 tons nonhazardous residual/18 tons per truck) = 0.11 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Acid Neutralization, Stabilization, Landfill	405 miles	Distance to Nearest Off-site Hazardous Waste Acid Neutralization, Stabilization, Landfill	405 miles
Distance to Off-site Recovery Facility	521 miles	Distance to Off-site Recovery Facility	521 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
Off-site Acid Recovery Cost	($170/ton) * (30 tons recovered waste/yr) = $5,100/yr	Off-site Acid Recovery Cost	($170/ton) * (30 tons recovered waste/yr) = $5,100/yr

Appendix O Example Cost Calculation: 1999 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Off-site Hazardous Acid Neutralization, Stabilization, Landfill Cost for Recovery Facility*	maximum(($38/ton) * (7.8 tons hazardous residual per yr) or ($316/load) * (4 Hazardous Waste Shipments) = $1,264/yr	Residual Off-site Hazardous Acid Neutralization, Stabilization, Landfill Cost for Recovery Facility*	maximum (($38/ton) * (5.8 tons hazardous residual per yr) or (($316/load) * (1.33 Hazardous Waste Shipments) = $1,264/yr
Residual Off-site Non-Hazardous Acid Neutralization, Stabilization, Landfill Cost for Recovery Facility*	($38/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-Hazardous Acid Neutralization, Stabilization, Landfill Cost for Recovery Facility*	($38/ton) * (2 tons non-hazardous residual per yr) = $76/yr
Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost	($1,410/load) * (1.33 Hazardous Loads + 0.11 Non-Hazardous Load) = $2,030/yr
Manifesting Costs	($236/shipment) * (1.7 recovery shipments/yr + 4 residual shipments/yr) = $1,345/yr	Manifesting Costs	($89/shipment) * (1.7 recovery shipments/yr + 1.44 residual shipments/yr) = $279/yr
Loading Costs	($2.57/ton) * (7.8 tons residual + 50 tons recovered waste) = $149/yr	Loading Costs	($2.57/ton) * (7.8 tons residual + 50 tons recovered waste) = $149/yr
Residual Waste Transportation Costs for Recovery Facility*	($3.50/mile)*(4 hazardous waste shipments/yr)*(405 miles to hazardous acid neutralization, stab., landfill/hazardous waste shipment) + ($3.50/mile)*(0 nonhazardous waste shipments/yr)*(405 miles to nonhazardous neutralization, stab., landfill/nonhazardous waste shipment) = $5,670/yr	Residual Waste Transportation Costs for Recovery Facility*	($3.50/mile)*(1.33 hazardous waste shipments/yr)*(405 miles to hazardous acid neutralization, stab., landfill/hazardous waste shipment) + ($3.50/mile)*(0.11 nonhazardous waste shipments/yr)*(405 miles to nonhazardous acid neutralization, stab., landfill/nonhazardous waste shipment) = $2,055/yr

Appendix O Example Cost Calculation: 1999 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.7 recovered waste shipments/yr)*(521 miles to hazardous acid regeneration/hazardous waste shipment) = $5,491/yr	Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.7 recovered waste shipments/yr)*(521 miles to acid regeneration/hazardous waste shipment) = $5,491/yr
Salvage (Recovered Product) Value	($298.12/ton acid) * (22.2 tons recovered acid/yr) = -$6,618/yr	Salvage (Recovered Product) Value	($298.12/ton acid) * (22.2 tons recovered acid/yr) = -$6,618/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee for Generator	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee for Recovery Facility*	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee for Generator	Given Oregon then: ($45 generation fee/ton)*(30 tons recovered waste/yr) = $1,575/yr	State Generation Tax/Fee for Recovery Facility*	Given Oregon then: ($45 generation fee/ton)*(6.5 tons recovered waste/yr) = $293/yr
Total	$43,149/yr		$22,420/yr
Incremental Costs	-$20,729/yr		

* Given wastes are transferred within the same NAICS, it is assumed that the recovery facility in most cases is owned by the same company that owns the generator facility. Costs for the recovery facility are added to the generator's costs because the same company carrying the burden of the added cost.

Appendix P Example Cost Calculation: 1997 Off-site Metals Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.32 fraction as residuals * 0.95 fraction characteristically hazardous) = 7.6 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered Off Site	0 tons recovered waste/yr	Quantity of Waste Recovered Off Site	25 tons recovered waste/yr
Estimated Hazardous Waste Quantity for Generator	100% of waste quantity will be disposed (1) * (50 tons recovered waste/yr) = 50 tons waste/yr	Estimated Residual Quantity for Recovery Facility*	32% of recovered waste quantity will be residual (0.06) * (50 tons recovered waste/yr) = 3 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity for Recovery Facility*	95% residual is characteristically hazardous; (0.95) * (8 tons residual/yr) = 7.6 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity for Recovery Facility*	5% residual is nonhazardous; (0.05) * (8 tons residual/yr) = 0.4 tons nonhazardous residual/yr

Appendix P **Example Cost Calculation: 1997 Off-site Metals Recovery Within Same NAICS (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (0 tons recovered waste) = 0 tons recovered metal	Estimated Recovered Product Quantity	20% of recovered waste quantity will be recovered metals product (0.20) * (25 tons recovered waste) = 5 tons recovered metal
Number of Off-site Metals Recovery Shipments per Year	0 tons recovered waste /18 tons per truck) = 0 recovery shipments per year	Number of Off-site Metals Recovery Shipments per Year	25 tons recovered waste /18 tons per truck) = 1.4 recovery shipments per year
Number of Off-site Hazardous Waste Shipments per Year by Generator	Given LQG then maximum of (4 shipments or 25 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.6 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Shipments per Year by Generator	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year for Recovery Facility*	(0.4 tons nonhazardous residual/18 tons per truck) = 0.02 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Landfill	338 miles	Distance to Nearest Off-site Hazardous Waste Landfill	338 miles
Distance to Off-site Recovery Facility	521 miles	Distance to Off-site Recovery Facility	521 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
Off-site Metals Recovery Cost	($308/ton) * (0 tons recovered waste/yr) = $0/yr	Off-site Metals Recovery Cost for Generator	($308/ton) * (25 tons recovered waste/yr) = $7,700/yr

Appendix P Example Cost Calculation: 1997 Off-site Metals Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Off-site Disposal Cost at Hazardous Landfill (baseline) for Generator	maximum(($312/ton) * (25 tons hazardous residual per yr) or ($2,246/load) * (4 Hazardous Waste Shipments) = $8,984/yr	Residual Off-site Hazardous Landfill Cost for Recovery Facility*	maximum (($312/ton) * (7.6 tons hazardous residual per yr) or (($2,246/load) * (1.33 Hazardous Waste Shipments) = $2,987/yr
Residual Off-site Non-Hazardous Landfill Cost	($111/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-Hazardous Landfill Cost for Recovery Facility*	($111/ton) * (0.4 tons non-hazardous residual per yr) = $44/yr
Waste Characterization Testing Cost for Generator	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost for Recovery Facility*	($1,410/load) * (1.33 Hazardous Loads + 0.02 Non-Hazardous Load) = $1,903/yr
Manifesting Costs for Generator	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs for Generator & Recovery Facility*	($89/shipment) * (1.35 shipments/yr + 1.4 recovery loads) = $85/yr
Loading Costs for Generator	($2.57/ton) * (25 tons waste) = $64/yr	Loading Costs for Generator & Recovery Facility*	($2.57/ton) * (8 tons residual + 25 tons recovered waste) = $85/yr
Hazardous Waste Transportation Costs for Generator	($3.73/mile)*(4 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $5,047/yr	Residual Waste Transportation Costs for Recovery Facility*	($3.73/mile)*(1.33 hazardous waste landfill shipments/yr)*(338 miles to hazardous landfill/hazardous waste shipment) + ($2.16/mile)*(0.02 nonhazardous waste landfill shipments/yr)*(50 miles to nonhazardous landfill/nonhazardous waste shipment) = $1,668/yr
Recovered Waste Transportation Cost	($6.20/mile)*(0 recovered waste shipments/yr)*(521 miles to metals recovery/hazardous waste shipment) = $0/yr	Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.4 recovered waste shipments/yr)*(521 miles to hazardous metals recovery/hazardous waste shipment) = $4,522/yr

Appendix P Example Cost Calculation: 1997 Off-site Metals Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Salvage (Recovered Product) Value	($4,770/ton metal) * (0 tons recovered metal/yr) = -$0/yr	Salvage (Recovered Product) Value	($4,770/ton metal) * (5 tons recovered metal/yr) = -$23,850/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee for Generator	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee for Recovery Facility*	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee for Generator	Given Oregon then: ($45 generation fee/ton)*(25 tons waste/yr) = $1,125/yr	State Generation Tax/Fee for Recovery Facility*	Given Oregon then: ($45 generation fee/ton)*(7.6 tons recovered waste/yr) = $342/yr
Total	$45,337/yr		$7,978/yr
Incremental Costs	-$37,359/yr		

* Given wastes are transferred within the same NAICS, it is assumed that the recovery facility in most cases is owned by the same company that owns the generator facility. Costs for the recovery facility are added to the generator's costs because the same company carrying the burden of the added cost.

Appendix Q Example Cost Calculation: 1997 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	25 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(25 tons hazardous waste/yr) - (25 tons recovered waste/yr)+ (25 tons recovered waste/yr*0.33 fraction as residuals * 0.85 fraction characteristically hazardous) = 7 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered Off Site	0 tons recovered waste/yr	Quantity of Waste Recovered Off Site	25 tons recovered waste/yr
Estimated Hazardous Waste Quantity for Generator	100% of waste quantity will be disposed (1) * (25 tons recovered waste/yr) = 25 tons waste/yr	Estimated Residual Quantity for Recovery Facility*	33% of recovered waste quantity will be residual (0.33) * (25 tons recovered waste/yr) = 8.2 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity for Recovery Facility*	85% residual is characteristically hazardous; (0.85) * (8.2 tons residual/yr) = 7 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity for Recovery Facility*	15% residual is nonhazardous; (0.15) * (8.2 tons residual/yr) = 1.2 tons nonhazardous residual/yr

Appendix Q Example Cost Calculation: 1997 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (0 tons recovered waste) = 0 tons recovered solvent	Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (25 tons recovered waste) = 16.8 tons recovered solvent
Number of Off-site Solvent Recovery Shipments per Year by Generator	0 tons recovered waste /18 tons per truck) = 0 recovery shipments per year	Number of Off-site Solvent Recovery Shipments per Year	25 tons recovered waste /18 tons per truck) = 1.4 recovery shipments per year
Number of Off-site Hazardous Waste Shipments per Year by Generator	Given LQG then maximum of (4 shipments or 25 tons hazardous waste/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year for Recovery Facility*	Given SQG and > 200 miles then maximum of (1.33 shipments or 7 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Shipments per Year by Generator	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year for Recovery Facility*	(1.2 tons nonhazardous residual/18 tons per truck) = 0.07 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Energy Recovery Facility	577 miles	Distance to Nearest Off-site Hazardous Waste Energy Recovery Facility	577 miles
Distance to Off-site Recovery Facility	521 miles	Distance to Off-site Recovery Facility	521 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
Off-site Solvent Recovery Cost	($1,066/ton) * (0 tons recovered waste/yr) = $0/yr	Off-site Solvent Recovery Cost	($1,066/ton) * (25 tons recovered waste/yr) = $26,650/yr

Appendix Q Example Cost Calculation: 1997 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Off-site Disposal Cost at Energy Recovery Facility/Cement Kiln (baseline)	maximum(($291/ton) * (25 tons hazardous residual per yr) = $7,275/yr	Residual Off-site Hazardous Energy Recovery Cost for Recovery Facility*	maximum (($291/ton) * (7 tons hazardous residual per yr) or (($338/load) * (1.33 Hazardous Waste Shipments) = $2,037/yr
Residual Off-site Non-hazardous Landfill Cost	($111/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-Hazardous Energy Recovery Cost	($291/ton) * (1.2 tons non-hazardous residual per yr) = $349/yr
Waste Characterization Testing Cost for Generator	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost for Recovery Facility*	($1,410/load) * (1.33 Hazardous Loads + 0.07 Non-Hazardous Load) = $1,974/yr
Manifesting Costs for Generator	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs for Generator & Recovery Facility*	($89/shipment) * (1.40 shipments/yr + 1.4 recovery loads) = $249/yr
Loading Costs for Generator	($2.57/ton) * (25 tons waste) = $64/yr	Loading Costs for Generator & Recovery Facility*	($2.57/ton) * (8.2 tons residual + 25 tons recovered waste) = $85/yr
Hazardous Waste Transportation Costs for Generator	($2.94/mile)*(4 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0 nonhazardous waste shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $6,786/yr	Residual Waste Transportation Costs for Recovery Facility*	($2.94/mile)*(1.33 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0.07 nonhazardous waste shipments/yr)*(577 miles to nonhazardous energy recovery/nonhazardous waste shipment) = $2,375/yr
Recovered Waste Transportation Cost	($6.20/mile)*(0 recovered waste shipments/yr)*(521 miles to hazardous landfill/hazardous waste shipment) = $0/yr	Recovered Waste Transportation Cost for Generator	($6.20/mile)*(7 recovered waste shipments/yr)*(521 miles to hazardous landfill/hazardous waste shipment) = $22,611/yr

Appendix Q Example Cost Calculation: 1997 Off-site Solvents Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Salvage (Recovered Product) Value	($1,543/ton solvent) * (0 tons recovered solvent/yr) = -$0/yr	Salvage (Recovered Product) Value	($1,543/ton solvent) * (16.8 tons recovered solvent/yr) = -$25,922/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee for Generator	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee for Recovery Facility*	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee for Generator	Given Oregon then: ($45 generation fee/ton)*(25 tons recovered waste/yr) = $1,125/yr	State Generation Tax/Fee for Recovery Facility*	Given Oregon then: ($45 generation fee/ton)*(7 tons recovered waste/yr) = $315/yr
Total	$45,367/yr		$43,056/yr
Incremental Costs	-$2,311/yr		

* Given wastes are transferred within the same NAICS, it is assumed that the recovery facility in most cases is owned by the same company that owns the generator facility. Costs for the recovery facility are added to the generator's costs because the same company carrying the burden of the added cost.

Appendix R Example Cost Calculation: 1997 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	30 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(30 tons hazardous waste/yr) - (30 tons recovered waste/yr)+ (30 tons recovered waste/yr*0.26 fraction as residuals * 0.75 fraction characteristically hazardous) = 5.8 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (1.3 tons/yr < tons hazardous waste/yr < 13.2 tons/yr) then SQG
Quantity of Waste Recovered Off Site	0 tons recovered waste/yr	Quantity of Waste Recovered Off Site	30 tons recovered waste/yr
Estimated Hazardous Waste Quantity by Generator	100% of recovered waste quantity will be disposed (1) * (30 tons recovered waste/yr) = 30 tons residual/yr	Estimated Residual Quantity by Recovery Facility*	26% of recovered waste quantity will be residual (0.26) * (30 tons recovered waste/yr) = 7.8 tons residual/yr
Estimated Hazardous Residual Quantity	100% residual is listed & characteristically hazardous; (1.00) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity by Recovery Facility*	75% residual is characteristically hazardous; (0.75) * (7.8 tons residual/yr) = 5.8 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity	0% residual is nonhazardous; (0) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity by Recovery Facility*	25% residual is nonhazardous; (0.25) * (7.8 tons residual/yr) = 2 tons nonhazardous residual/yr

Appendix R Example Cost Calculation: 1997 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered acid product (0.74) * (0 tons recovered waste) = 0 tons recovered acid	Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered acid product (0.74) * (30 tons recovered waste) = 22.2 tons recovered acid
Number of Off-site Acid Recovery Shipments per Year	0 tons recovered waste /18 tons per truck) = 0 recovery shipments per year	Number of Off-site Acid Recovery Shipments per Year by Generator	30 tons recovered waste /18 tons per truck) = 1.7 recovery shipments per year
Number of Off-site Hazardous Waste Shipments per Year by Generator	Given LQG then maximum of (4 shipments or 30 tons hazardous residual/18 tons per truck) = 4 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year by Recovery Facility*	Given SQG and > 200 miles then maximum of (1.33 shipments or 7.8 tons hazardous residual/18 tons per truck) = 1.33 hazardous waste shipments per year
Number of Off-site Nonhazardous Waste Shipments per Year	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-hazardous Waste Shipments per Year by Recovery Facility*	(2 tons nonhazardous residual/18 tons per truck) = 0.11 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Acid Neutralization, Stabilization, Landfill	405 miles	Distance to Nearest Off-site Hazardous Waste Acid Neutralization, Stabilization, Landfill	405 miles
Distance to Off-site Recovery Facility	521 miles	Distance to Off-site Recovery Facility	521 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
Of-site Acid Recovery Cost for Generator	($170/ton) * (0 tons recovered waste/yr) = $0/yr	Off-site Acid Recovery Cost for Generator	($170/ton) * (30 tons recovered waste/yr) = $5,100/yr

Appendix R Example Cost Calculation: 1997 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
On-site Treatment Cost by Acid Neutralization (baseline)	maximum(($3.26/ton + $18,830) * (30 tons hazardous residual per yr) = $18,928/yr	Residual Off-site Hazardous Neutralization, Stabilization, Landfill Cost by Recovery Facility*	maximum (($38/ton) * (5.8 tons hazardous residual per yr) or (($316/load) * (1.33 Hazardous Waste Shipments) = $420/yr
Residual Off-site Non-hazardous Landfill Cost	($111/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-Hazardous Neutralization, Stabilization, Landfill Cost by Recovery Facility*	($38/ton) * (2 tons non-hazardous residual per yr) = $76/yr
Waste Characterization Testing Cost	($1,410/load) * (0 Hazardous Loads + 0 Non-Hazardous Load) = $0/yr	Waste Characterization Testing Cost by Recovery Facility*	($1,410/load) * (1.33 Hazardous Loads + 0.11 Non-Hazardous Load) = $2,044/yr
Manifesting Costs	($236/shipment) * (0 shipments/yr) = $0/yr	Manifesting Costs for Generator & Recovery Facility*	($89/shipment) * (1.44 shipments/yr + 1.7 recovery loads) = $279/yr
Loading Costs	($2.57/ton) * (0 tons residual) = $0/yr	Loading Costs for Generator & by Recovery Facility*	($2.57/ton) * (7.8 tons residual + 30 tons recovered waste) = $97/yr
Residual Waste Transportation Costs	($3.50/mile)*(0 hazardous waste shipments/yr)*(405 miles to hazardous neutralization, stab., landfill/hazardous waste shipment) + ($3.50/mile)*(0 nonhazardous waste shipments/yr)*(405 miles to nonhazardous neutralization, stab., landfill/nonhazardous waste shipment) = $0/yr	Residual Waste Transportation Costs by Recovery Facility*	($3.50/mile)*(1.33 hazardous waste shipments/yr)*(405 miles to hazardous neutralization, stab., landfill/hazardous waste shipment) + ($3.50/mile)*(0.11 nonhazardous waste shipments/yr)*(405 miles to nonhazardous neutralization, stab., landfill/nonhazardous waste shipment) = $2,055/yr

Appendix R Example Cost Calculation: 1997 Off-site Acid Recovery Within Same NAICS (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Recovered Waste Transportation Cost	($6.20/mile)*(0 recovered waste shipments/yr)*(521 miles to hazardous landfill/hazardous waste shipment) = $0/yr	Recovered Waste Transportation Cost for Generator	($6.20/mile)*(1.7 recovered waste shipments/yr)*(521 miles to hazardous acid regeneration/hazardous waste shipment) = $5,491/yr
Salvage (Recovered Product) Value	($298.12/ton acid) * (0 tons recovered acid/yr) = -$0/yr	Salvage (Recovered Product) Value	($298.12/ton acid) * (22.2 tons recovered acid/yr) = -$6,618/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given SQG then $2,191/yr
Manifest Training Cost	Given LQG then $0/yr	Manifest Training Cost	Given SQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given SQG then $1,215/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given SQG then $0
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee for Generator	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee for Recovery Facility*	Given Oregon and SQG then: $300 activity verification fee/yr
State Generation Tax/Fee for Generator	Given Oregon then: ($45 generation fee/ton)*(30 tons recovered waste/yr) = $1,350/yr	State Generation Tax/Fee for Recovery Facility*	Given Oregon then: ($45 generation fee/ton)*(5.8 tons recovered waste/yr) = $261/yr
Total	$41,983/yr		$21,538/yr
Incremental Costs	-$20,445/yr		

* Given wastes are transferred within the same NAICS, it is assumed that the recovery facility in most cases is owned by the same company that owns the generator facility. Costs for the recovery facility are added to the generator's costs because the same company carrying the burden of the added cost.

Appendix S **Example Cost Calculation: 1999 Off-site Solvents Recovery Outside Industry Group Shifting to On-Site Solvent Recovery (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	140 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(140 tons hazardous waste/yr) - (140 tons recovered waste/yr)+ (140 tons recovered waste/yr*0.33 fraction as residuals * 0.85 fraction characteristically hazardous) = 39 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG
Quantity of Waste Recovered On Site	0 tons recovered waste/yr	Quantity of Waste Recovered On Site	140 tons recovered waste/yr
Quantity of Waste Recovered Off Site	140 tons recovered waste/yr	Quantity of Waste Recovered Off Site	0 tons recovered waste/yr
Estimated Residual Quantity*	33% of recovered waste quantity will be residual (0.33) * (0 tons recovered waste/yr) = 0 tons residual/yr	Estimated Residual Quantity	33% of recovered waste quantity will be residual (0.33) * (140 tons recovered waste/yr) = 46 tons residual/yr
Estimated Hazardous Residual Quantity*	85% residual is characteristically hazardous; (0.85) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	85% residual is characteristically hazardous; (0.85) * (46 tons residual/yr) = 39 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity*	15% residual is nonhazardous; (0.15) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	15% residual is nonhazardous; (0.15) * (46 tons residual/yr) = 7 tons nonhazardous residual/yr

Appendix S **Example Cost Calculation: 1999 Off-site Solvents Recovery Outside Industry Group Shifting to On-Site Solvent Recovery (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (140 tons recovered waste) = 94 tons recovered solvent	Estimated Recovered Product Quantity	67% of recovered waste quantity will be recovered solvent product (0.67) * (140 tons recovered waste) = 94 tons recovered solvent
Number of Off-site Hazardous Waste Residual Shipments per Year*	0 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year	Given LQG and > 200 miles then maximum of (4 shipments or 39 tons recovery wastes/18 ton truck) = 4 recovery shipments per year
Number of Off Site Recovery Shipments per Year	Given LQG and > 200 miles then maximum of (4 shipments or 140 tons recovery wastes/18 ton truck) = 7.8 recovery shipments per year	Number of Off Site Recovery Shipments per Year	0 recovery shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year*	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Facility Residual Shipments per Year	(7 tons nonhazardous residual/18 tons per truck) = 0.4 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Energy Recovery	577 miles	Distance to Nearest Off-site Hazardous Waste Energy Recovery	577 miles
Distance to Nearest Off-site Recovery Facility.	521 miles	Distance to Nearest Off-site Recovery Facility.	521 miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			
On-site Solvent Recovery Cost	($43.29/ton) * (0 tons recovered waste/yr) + $1,615 = $0/yr	On-site Solvent Recovery Cost	($43.29/ton) * (140 tons recovered waste/yr) + $1,615 = $7,676/yr

Appendix S **Example Cost Calculation: 1999 Off-site Solvents Recovery Outside Industry Group Shifting to On-Site Solvent Recovery (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Off-site Solvent Recovery Cost	($1,066/ton) * (140 tons recovered waste/yr) = $149,240/yr	Off-site Solvent Recovery Cost	Given small loads (less than 60% of a full 18 ton load): ($1,066/ton + $160/ton surcharge) * (0 tons recovered waste/yr) = $0/yr
Residual Off-site Hazardous Energy Recovery Cost*	Given small loads (less than 60% of a full 18 ton load): (($291/ton + $44/ton) * (0 Hazardous Waste Shipments) = $0/yr	Residual Off-site Hazardous Energy Recovery Cost	Given small loads (less than 60% of a full 18 ton load): (($291/ton + $44/ton) * (39 tons hazardous residual per yr) = $13,065/yr
Residual Off-site Non-hazardous Energy Recovery Cost	($291/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Energy Recovery Cost	($291/ton) * (7 tons non-hazardous residual per yr) = $2,037/yr
Waste Characterization Testing Cost	($1,410/load) * (7.8 Hazardous Loads + 0 Non-Hazardous Load) = $10,998/yr	Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0.4 Non-Hazardous Load) = $6,240/yr
Manifesting Costs	($236/shipment) * (7.8 shipments/yr) = $1,841/yr	Manifesting Costs	($236/shipment) * (4 shipments/yr) = $944/yr + ($89/shipment) * (0.4 shipments/yr) = $980/yr
Loading Costs	Cost included in Off-site Solvent Recovery Costs	Loading Costs	($2.57/ton) * (46 tons residual) = $118/yr
Residual Waste Transportation Costs	($2.94/mile)*(0 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0 nonhazardous waste shipments/yr)*(577 miles to nonhazardous Energy recovery/nonhazardous waste shipment) = $0/yr	Residual Waste Transportation Costs	($2.94/mile)*(4 hazardous waste shipments/yr)*(577 miles to hazardous energy recovery/hazardous waste shipment) + ($2.94/mile)*(0.4 nonhazardous waste shipments/yr)*(577 miles to nonhazardous Energy recovery/nonhazardous waste shipment) = $7,464/yr

Appendix S **Example Cost Calculation: 1999 Off-site Solvents Recovery Outside Industry Group Shifting to On-Site Solvent Recovery (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Recovered Waste Transportation Cost	Cost included in Management	Recovered Waste Transportation Cost	(6.20/mile)*(0 recovered waste shipments/yr)*(521 miles to recovery facility/hazardous waste shipments) = $0/yr
Salvage (Recovered Product) Value	($1,543/ton solvent) * (94 tons recovered solvent/yr) = -$145,042/yr	Salvage (Recovered Product) Value	($1,543/ton solvent) * (94 tons recovered solvent/yr) = -$145,042/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given LQG then $9,794/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given LQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given LQG then $2,796
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(140 tons recovered waste/yr) = $6,300/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(39 tons residual/yr) = $1,755/yr
Total	$46,870/yr		-$81,535/yr
Incremental Costs	-$128,405/yr		

*Given wastes are transferred outside industry group, it is assumed that the recovery facility in most cases is a commercial company separate and distinct from the generator. Cost for the recovery facility are not included in the generator costs and are assumed to be a portion of the offsite recovery facility unit cost. Costs not listed separately for off-site commercial recovery facilities include all costs associated with residual management, transportation, and disposal.

Appendix T **Example Cost Calculation: 1999 Off-site Acid Recovery Outside Same NAICS Shifting to On-site Acid Recovery (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Cost Inputs			
Total Quantity of Hazardous Waste Generated	140 tons hazardous waste/yr	Total Quantity of Hazardous Waste Generated	(140 tons hazardous waste/yr) - (140 tons recovered waste/yr)+ (140 tons recovered waste/yr*0.26 fraction as residuals * 0.75 fraction characteristically hazardous) = 27.3 tons hazardous waste/yr (recovered waste quantity no longer hazardous by definition)
Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG	Generator Status	If (tons hazardous waste/yr > 13.2 tons/yr) then LQG
Quantity of Waste Recovered On Site	0 tons recovered waste/yr	Quantity of Waste Recovered On Site	140 tons recovered waste/yr
Quantity of Waste Recovered Off Site	140 tons recovered waste/yr	Quantity of Waste Recovered Off Site	0 tons recovered waste/yr
Estimated Residual Quantity*	26% of recovered waste quantity will be residual (0.26) * (0 tons recovered waste/yr) = 0 tons residual/yr	Estimated Residual Quantity	26% of recovered waste quantity will be residual (0.26) * (140 tons recovered waste/yr) = 36.4 tons residual/yr
Estimated Hazardous Residual Quantity*	75% residual is characteristically hazardous; (0.75) * (0 tons residual/yr) = 0 tons hazardous residual/yr	Estimated Hazardous Residual Quantity	75% residual is characteristically hazardous; (0.75) * (36.4 tons residual/yr) = 27.3 tons hazardous residual/yr
Estimated Nonhazardous Residual Quantity*	25% residual is nonhazardous; (0.25) * (0 tons residual/yr) = 0 tons nonhazardous residual/yr	Estimated Non-hazardous Residual Quantity	25% residual is nonhazardous; (0.25) * (36.4 tons residual/yr) = 9.1 tons nonhazardous residual/yr

Appendix T **Example Cost Calculation: 1999 Off-site Acid Recovery Outside Same NAICS Shifting to On-site Acid Recovery (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered acid product (0.74) * (140 tons recovered waste) = 103.6 tons recovered acid	Estimated Recovered Product Quantity	74% of recovered waste quantity will be recovered acid product (0.74) * (140 tons recovered waste) = 103.6 tons recovered acid
Number of Off-site Hazardous Waste Residual Shipments per Year*	0 hazardous waste shipments per year	Number of Off-site Hazardous Waste Residual Shipments per Year	Given LQG and > 200 miles then maximum of (4 shipments or 27.3 tons recovery wastes/18 ton truck) = 4 recovery shipments per year
Number of Off Site Recovery Shipments per Year	Given LQG and > 200 miles then maximum of (4 shipments or 140 tons recovery wastes/18 ton truck) = 7.8 recovery shipments per year	Number of Off Site Recovery Shipments per Year	0 recovery shipments per year
Number of Off-site Nonhazardous Waste Residual Shipments per Year*	(0 tons nonhazardous residual/18 tons per truck) = 0 nonhazardous waste shipments per year	Number of Off-site Non-Hazardous Waste Residual Shipments per Year	(9.1 tons nonhazardous residual/18 tons per truck) = 0.51 nonhazardous waste shipments per year
Distance to Nearest Off-site Hazardous Waste Facility for Acid Neutralization, Stabilization, and Landfill	405 miles	Distance to Nearest Off-site Hazardous Waste Facility for Acid Neutralization, Stabilization, and Landfill	405 miles
Distance to Nearest Off-site Recovery Facility.	521 miles	Distance to Nearest Off-site Recovery Facility.	521miles
Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles	Distance to Nearest Off-site Non-hazardous Waste Landfill	50 miles
Location of Generator	Oregon	Location of Generator	Oregon
Cost Calculations (costs are positive and revenues are negative)			

Appendix T Example Cost Calculation: 1999 Off-site Acid Recovery Outside Same NAICS Shifting to On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
On-site Acid Recovery Cost	($79.50/ton) * (0 tons recovered waste/yr) + $1,804 = $0/yr	On-site Acid Recovery Cost	($79.50/ton) * (140 tons recovered waste/yr) + $1,804 = $12,934/yr
Off-site Acid Recovery Cost	($170/ton) * (140 tons recovered waste/yr) = $23,800/yr	Off-site Acid Recovery Cost	Given small loads (less than 60% of a full 18 ton load): ($170/ton) * (0 tons recovered waste/yr) = $0/yr
Residual Off-site Hazardous Acid Neutralization, Stabilization, Landfill Cost*	maximum(($38/ton) * (0 tons hazardous residual per yr) or ($316/load) * (0 Hazardous Waste Shipments) = $0/yr	Residual Off-site Hazardous Acid Neutralization, Stabilization, Landfill Cost	maximum (($38/ton) * (27.3 tons hazardous residual per yr) or (($316/load) * (4 Hazardous Waste Shipments) = $1,037/yr
Residual Off-site Non-hazardous Acid Neutralization, Stabilization, Landfill Cost	($38/ton) * (0 tons non-hazardous residual per yr) = $0/yr	Residual Off-site Non-hazardous Acid Neutralization, Stabilization, Landfill Cost	($38/ton) * (9.1 tons non-hazardous residual per yr) = $346/yr
Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0 Non-Hazardous Load) = $5,640/yr	Waste Characterization Testing Cost	($1,410/load) * (4 Hazardous Loads + 0.51 Non-Hazardous Load) = $6,359/yr
Manifesting Costs	($236/shipment) * (4 shipments/yr) = $944/yr	Manifesting Costs	($236/shipment) * (4 shipments/yr) + ($89/shipment) * (0.51 shipments/yr) = $989/yr
Loading Costs	Cost included in Off-site Acid Recovery Costs	Loading Costs	($2.57/ton) * (36.4 tons residual) = $94/yr

Appendix T Example Cost Calculation: 1999 Off-site Acid Recovery Outside Same NAICS Shifting to On-site Acid Recovery (2001 $)			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
Residual Waste Transportation Costs	($3.05/mile)*(0 hazardous waste shipments/yr)*(405 miles to hazardous landfill/hazardous waste shipment) + ($3.05/mile)*(0 nonhazardous waste shipments/yr)*(405 miles to nonhazardous landfill/nonhazardous waste shipment) = $0/yr	Residual Waste Transportation Costs	($3.05/mile)*(4 hazardous waste shipments/yr)*(405 miles to hazardous landfill/hazardous waste shipment) + ($3.05/mile)*(0.51 nonhazardous waste shipments/yr)*(405 miles to nonhazardous landfill/nonhazardous waste shipment) = $5,571/yr
Recovered Waste Transportation Cost	Cost included in Off-site Acid Recovery Costs	Recovered Waste Transportation Cost	(6.20/mile)*(0 recovered waste shipments/yr)*(521 miles to recovery facility/hazardous waste shipments) = $0/yr
Salvage (Recovered Product) Value	($298.12/ton acid) * (103.6 tons recovered acid/yr) = -$30,885/yr	Salvage (Recovered Product) Value	($298.12/ton acid) * (103.6 tons recovered acid/yr) = -$30,885/yr
Hazardous Material Training Cost	Given LQG then $9,794/yr	Hazardous Material Training Cost	Given LQG then $9,794/yr
Manifest Training Cost	Given LQG then $1,828/yr	Manifest Training Cost	Given LQG then $1,828/yr
Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr	Biennial Report/General Administrative Duties Cost	Given LQG then $2,430/yr
Contingency Planning Cost	Given LQG then $2,796	Contingency Planning Cost	Given LQG then $2,796
Initial Waste Characterization Cost	$6,160	Initial Waste Characterization Cost	$6,160
Exclusion Filing Fee (One time Expenditure)	$0	Exclusion Filing Fee (One time Expenditure)	$639
State Facility Tax/Fee	Given Oregon and LQG then: $525 activity verification fee/yr	State Facility Tax/Fee	Given Oregon and SQG then: $300 activity verification fee/yr

Appendix T **Example Cost Calculation: 1999 Off-site Acid Recovery Outside Same NAICS Shifting to On-site Acid Recovery (2001 $)**			
Pre-Rule Cost Calculation		**Post-Rule Cost Calculation**	
State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(140 tons recovered waste/yr) = $1,800/yr	State Generation Tax/Fee	Given Oregon then: ($45 generation fee/ton)*(27.3 tons residual/yr) = $1,229/yr
Total	$24,832/yr		$21,621/yr
Incremental Costs	-$3,211/yr		

*Given wastes are transferred outside the same NAICS, it is assumed that the recovery facility in most cases is a commercial company separate and distinct from the generator. Cost for the recovery facility are not included in the generator costs and are assumed to be a portion of the offsite recovery facility unit cost. Costs are not listed separately for off-site commercial recovery facilities include all costs associated with residual management, transportation, and disposal.